DICOM Conformance Statement
Centricity Enterprise Archive 2.0 Product Line

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GE Medical Systems
Information Technologies

Applicare Center of Excellence

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1 INTRODUCTION

1.1 Scope and Field of Application

This document is the DICOM Conformance Statement for the Centricity Archive 2.0 product of GE Medical Systems. The purpose of this document is to describe how the Centricity Archive application collaborates in a DICOM network with other Medical Imaging applications that conform to the DICOM 3.0 standard.

1.2 References

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 15 (NEMA PS 3.(1-14).2000).

1.3 Definitions

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 15 (NEMA PS 3.(1-14).2000).

1.4 Symbols and Abbreviations

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 15 (NEMA PS 3.(1-14).2000).

The name GEMS used in this document refers to GE Medical Systems.

The name EA used in this document refers to Centricity Archive version 2.0.

1.5 Revision History

Version	Date	Description
1.0 Draft 1	15-May-2003	Initial version created for M3 release
1.0 Final	23-Jul-2003	Added asynchronous store, updated query fields, textual adjustments
1.1 Final	5-Dec-2003	Added supported SOP class

1.6 Important Considerations for the Reader

1.6.1 General

This DICOM Conformance Statement by itself is not sufficient to guarantee successful connectivity between EA and equipment from other vendors. The following considerations should be made:

- The integration of equipment from different vendors (including GEMS) goes beyond the scope of the DICOM 3.0 standard and the DICOM Conformance Statements from GEMS 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 GEMS 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 is met.
- With regard to the future evolution of the DICOM 3.0 standard GEMS reserves the right to make changes to the EA architecture described in this document. The user (or user's agent) should ensure that any equipment connected via DICOM to GEMS equipment also follows the future evolution of the DICOM 3.0 standard. Failure to do so may result in (partial) loss of connectivity.

1.6.2 Flexible DICOM Dictionary

EA is based on a flexible DICOM library. All DICOM definitions are described in a number of text files. These files are:

- Dcmiod.xml: An XML file that contains all IODs supported by CA. By default all IODs described in the DICOM 98 standard are included.
- Service.xml: An XML enumeration of all services offered by CA.
- Dict.dat: A description of all DICOM tags as they occur in the DICOM standard, and a number of private tags. The private tags are described in this conformance statement.
- In many places Storage SOP classes are mentioned throughout this document. The next table gives an overview of the generally supported storage SOP classes.

Although these files can be easily modified, the user should be very cautious before doing so.

Default Storage SOP classes	
SOP Class Name	**SOP Class UID**
CR Image	1.2.840.10008.5.1.4.1.1.1
DX Image (Presentation)	1.2.840.10008.5.1.4.1.1.1.1
DX Image (Process)	1.2.840.10008.5.1.4.1.1.1.1.1
DX Mammography Image (Presentation)	1.2.840.10008.5.1.4.1.1.1.2
DX Mammography Image (Process)	1.2.840.10008.5.1.4.1.1.1.2.1
DX Intra-oral Image (Presentation)	1.2.840.10008.5.1.4.1.1.1.3
DX Intra-oral Image (Process)	1.2.840.10008.5.1.4.1.1.1.3.1
CT Image	1.2.840.10008.5.1.4.1.1.2
US Multi-frame Image (Retired)	1.2.840.10008.5.1.4.1.1.3
US Multi-frame Image	1.2.840.10008.5.1.4.1.1.3.1
MR Image	1.2.840.10008.5.1.4.1.1.4
NM Image (Retired)	1.2.840.10008.5.1.4.1.1.5
US Image (Retired)	1.2.840.10008.5.1.4.1.1.6
US Image	1.2.840.10008.5.1.4.1.1.6.1
SC Image	1.2.840.10008.5.1.4.1.1.7
Multi-Frame Single Bit SC Image	1.2.840.10008.5.1.4.1.1.7.1
Multi-Frame Grayscale Byte SC Image	1.2.840.10008.5.1.4.1.1.7.2
Multi-Frame Grayscale Word SC Image	1.2.840.10008.5.1.4.1.1.7.3
Multi-Frame True Color SC Image	1.2.840.10008.5.1.4.1.1.7.4
Standalone Overlay	1.2.840.10008.5.1.4.1.1.8
Standalone Curve	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT	1.2.840.10008.5.1.4.1.1.10
Standalone VOI LUT	1.2.840.10008.5.1.4.1.1.11
Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.11.1
XA Image	1.2.840.10008.5.1.4.1.1.12.1
RF Image	1.2.840.10008.5.1.4.1.1.12.2
XA Bi-PlaneImage	1.2.840.10008.5.1.4.1.1.12.3
NM Image	1.2.840.10008.5.1.4.1.1.20
VL Image (Retired)	1.2.840.10008.5.1.4.1.1.77.1
VL Multi-frame Image (Retired)	1.2.840.10008.5.1.4.1.1.77.2
VL Endoscopic Image	1.2.840.10008.5.1.4.1.1.77.1.1
VL Microscopic Image	1.2.840.10008.5.1.4.1.1.77.1.2
VL Slide-Coordinates Microscopic Image	1.2.840.10008.5.1.4.1.1.77.1.3
VL Photographic Image	1.2.840.10008.5.1.4.1.1.77.1.4
Basic Text Structured Reports	1.2.840.10008.5.1.4.1.1.88.11
Enhanced Structured Reports	1.2.840.10008.5.1.4.1.1.88.22
Comprehensive Structured Reports	1.2.840.10008.5.1.4.1.1.88.33
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Key Object Reference	1.2.840.10008.5.1.4.1.1.88.59
Collage (private)	1.2.528.1.1001.5.1.1.1
PET Image	1.2.840.10008.5.1.4.1.1.128
Standalone PET Curve	1.2.840.10008.5.1.4.1.1.129
RT Image	1.2.840.10008.5.1.4.1.1.481.1
RT Dose	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set	1.2.840.10008.5.1.4.1.1.481.3
RT Beams Treatment Record	1.2.840.10008.5.1.4.1.1.481.4
RT Plan	1.2.840.10008.5.1.4.1.1.481.5
RT Brachy Treatment Record	1.2.840.10008.5.1.4.1.1.481.6
RT Treatment Summary Record	1.2.840.10008.5.1.4.1.1.481.7
Genius NM Image	1.2.840.113619.4.27

1.7 Acknowledgment of Trade names

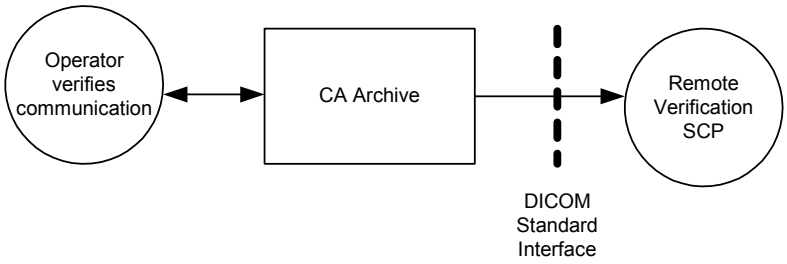
All trade names mentioned in this document are recognized.

2 IMPLEMENTATION MODEL

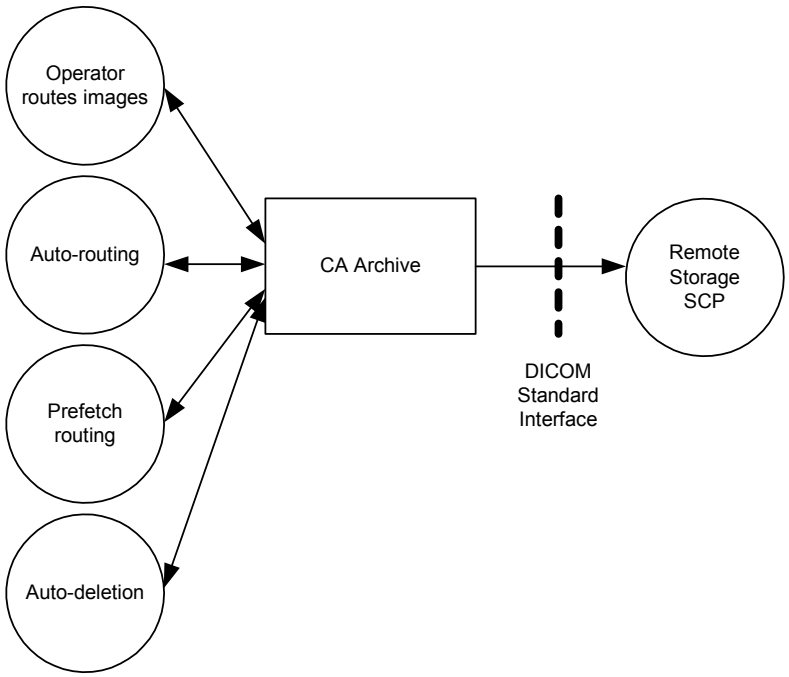
Within one CA multiple archives can be configured. For each configured archive, one Application Entity Title can be specified.

2.1 Application Data Flow Diagram

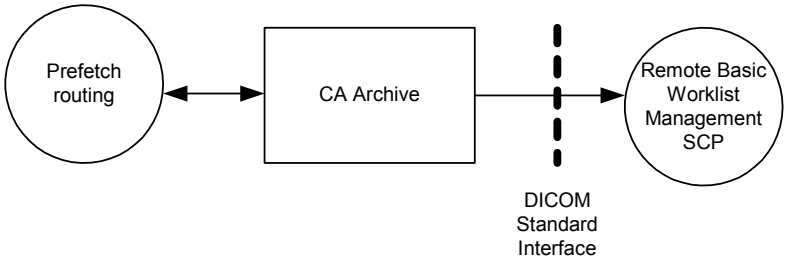
2.1.1 Remote Verification SCP



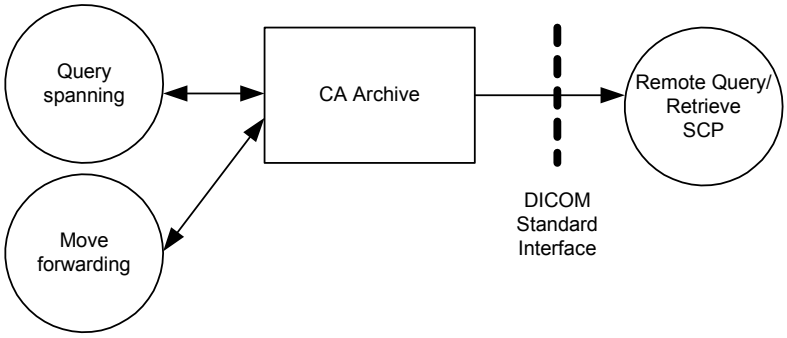
2.1.2 Remote Storage SCP



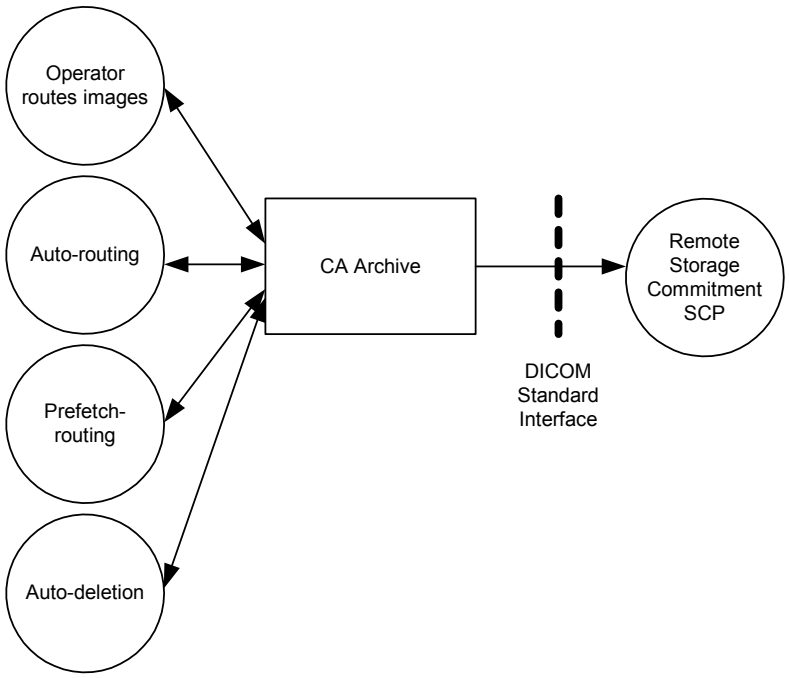
2.1.3 Remote Basic Worklist Management SCP



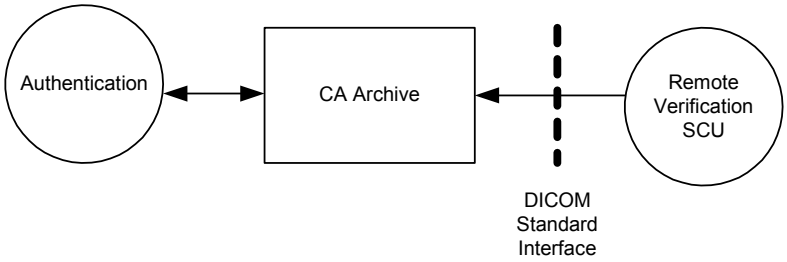
2.1.4 Remote Query/Retrieve SCP



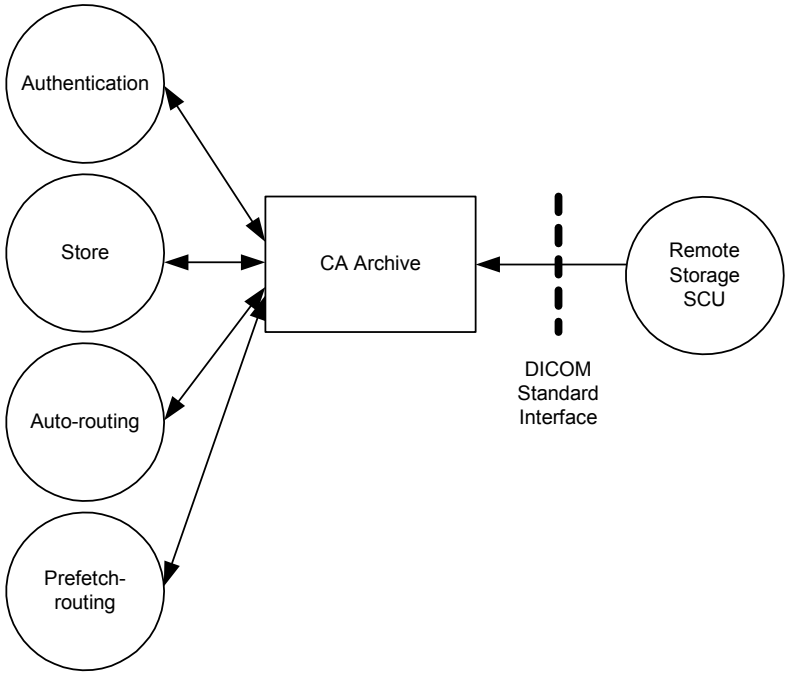
2.1.5 Remote Storage Commitment SCP



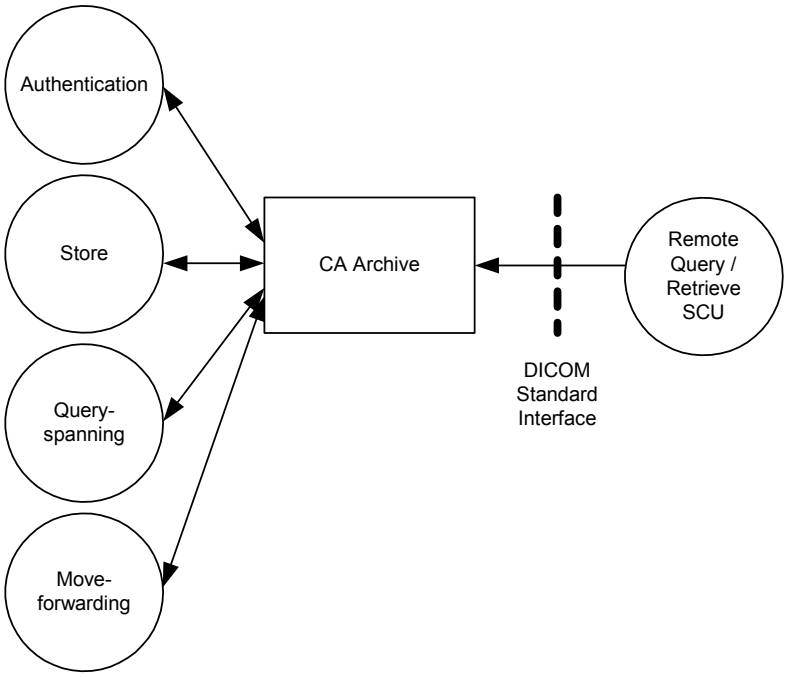
2.1.6 Remote Verification SCU



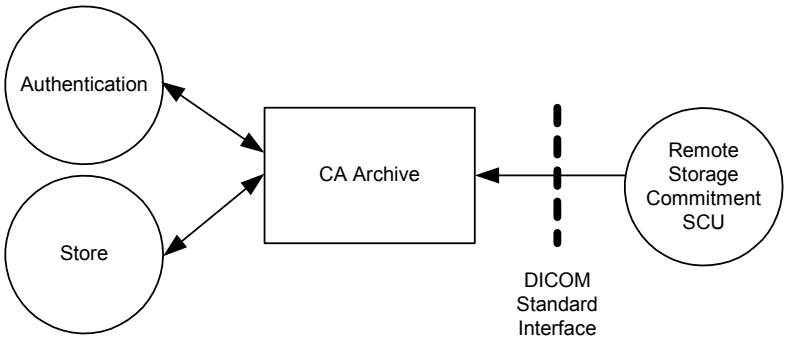
2.1.7 Remote Storage SCU



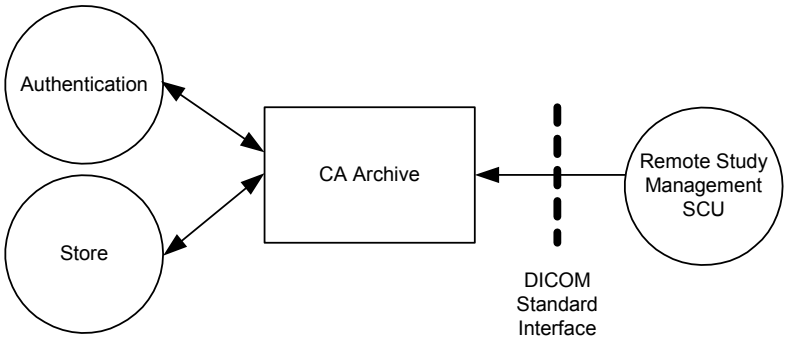
2.1.8 Remote Query/Retrieve SCU



2.1.9 Remote Storage Commitment SCU



2.1.10 Remote Study Management SCU



2.2 Functional Definitions of Application Entities

CA can be configured into multiple “partitions” or archives. Each archive is presented to the outside world as an Application Entity with its own AE title. Each archives provides its own physical storage and index database. For example, if a single instance is sent to two EA archives, two copies of the instance are store: one in each archive. Furthermore, instances stored in one archive cannot be obtained via another archive.

The same DICOM functionality is provided for each archive. Each archive acts as an SCP for verification, storage, query, retrieve, storage commitment, and detached study management SOP classes. It acts as an SCU for the verification, storage, storage commitment, and modality worklist SOP classes.

2.3 Sequencing of Real World Activities

EA supports query-spanning and move-forwarding to facilitate image management for images that are distributed over several Application Entities.

If the query-spanning feature is enabled, a query performed on EA will cause EA to span the query to one or more remote DICOM databases. Both the results from the local query and the remote queries will be merged and returned to the querying client.

If the move-forwarding feature is enabled, a retrieve performed on EA might cause EA to query one or more remote DICOM databases followed by a retrieve operation from one of the remote DICOM databases. Note that this will only happen when the client requests an instance that is not stored in EA but in one of the remote DICOM databases.

3 APPLICATION ENTITY SPECIFICATIONS

3.1 Application DICOM services AE Specifications

EA provides support for the following DICOM V3.0 SOP Classes as an SCU:

SOP Classes as SCU	
SOP Class Name	**SOP Class UID**
Verification	1.2.840.10008.1.1
Default Storage Application SOP Classes	See § 1.6.2
Modality Worklist Management	1.2.840.10008.5.1.4.31
Patient Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient Study Only Query/ Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient Study Only Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2
Storage Commitment Push Model	1.2.840.10008.1.20.1

EA provides support for the following DICOM V3.0 SOP Classes as an SCP:

SOP Classes as SCP	
SOP Class Name	**SOP Class UID**
Verification	1.2.840.10008.1.1
Default Storage Application SOP Classes	See § 1.6.2
Patient Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Patient Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.1.3
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Study Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.2.3
Patient Study Only Query/ Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient Study Only Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2
Patient Study Only Query/ Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.3.3
Storage Commitment Push Model	1.2.840.10008.1.20.1
Detached Study Management	1.2.840.10008.3.1.2.3.1

3.1.1 Association Establishment Policies

This section describes the conditions under which the AE will either initiate or accept an association.

3.1.1.1 General

The maximum length PDU for an association initiated by EA is 16,384.

The SOP class extended negotiation is not supported.

The user information Items sent by this product are:
- Maximum PDU length
- Implementation UID
- Implementation Version Name

By default EA will accept the PDU length as proposed by the association initiator, with a configurable maximum per association initiator. The maximum supported PDU length by EA is 10 MB.

The user information Items supported by EA are:
- Asynchronous Operation Window

3.1.1.2 Number of Associations

EA supports multiple associations both as an SCU and SCP. By default the maximum number of simultaneous associations that the Application will support is 10 for both SCP and SCU. The optimal number depends on the used hardware, network speed etc.

3.1.1.3 Asynchronous Nature

EA supports asynchronous operations but will not actively request it. The maximum number of asynchronous operations supported by EA is 100.

3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: 1.2.528.1.1001.2.20020315.1
The version name is: AMI_DICOM00_5

3.1.2 Association Initiation Policy

CA initiates associations for the following activities:

- The operator wants to verify the DICOM communication with a remote system (3.1.2.1).
- Incoming or prefetched images are routed to a remote system, or images are routed manually by the operator (3.1.2.2)
- A DICOM Modality Worklist is retrieved to do prefetching (3.1.2.3).
- A query is spanned to a remote DICOM entity (3.1.2.4), or a move request is forwarded to a remote DICOM archive (3.1.2.5).
- To request storage commitment for instances that where transferred to a remote AE (3.1.2.6).

3.1.2.1 Remote Verification SCP

3.1.2.1.1 Associated Real World Activity

CA sends out a request to test DICOM communication with a remote DICOM system.

3.1.2.1.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name	UID		Negotiation
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.1.3 SOP Specific Conformance Statement for SOP Class Verification

EA provides standard conformance.

3.1.2.2 Remote Storage SCP

3.1.2.2.1 Associated Real World Activity

The following activities can trigger EA to send instances to one or more remote system:

- The operator routes instances
- An incoming instance is immediately forwarded to other Application Entities (Auto-routing)
- The prefetch/routing mechanism needs to send priors to Application Entities (e.g. workstations).
- EA migrates instances to a remote DICOM database (Auto-deletion)

3.1.2.2.2 Proposed Presentation Contexts

Presentation Context Table for Send To Remote System				
Abstract Syntax		Transfer Syntax	Role	Extended
Name	UID			Negotiation
Default Application SOP Classes	See § 1.6.2	See below	SCU	None

Transfer Syntaxes for Send To Remote System	
Name	UID
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
Explicit VR, Lossy JPEG 8-Bit Image Compression[1)]	1.2.840.10008.1.2.4.50
Explicit VR, Lossy JPEG 12-Bit Image Compression[1)]	1.2.840.10008.1.2.4.51
Explicit VR, JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70

[1)] These transfer syntaxes are used if:

- An image is stored using lossy compression
- The client is configured such that lossy compression should be used when images are sent to this client. This can be configured via the Management Console.

3.1.2.2.3 SOP Specific Conformance Statement for SOP Class Storage

EA provides full (level 2) conformance. This means that upon sending an image received via DICOM on to another DICOM compliant system it will send out all attributes that it received (this includes private attributes from other vendors).

In case of failure, the transfer is retried at a later time. The number of retries and the interval between them can be configured. If EA fails to complete the transfer within the maximum number of retries the transfer is marked as failed and EA will no longer retry the transfer. EA keeps a log of all pending and completed transfers. This log can be viewed via the Management Console.

When a remote system requires an explicit transfer syntax, and the image stored in EA is implicit, CA will behave conform supplement 14 “Unknown Value Representation”. Consequently it will encode unknown attributes as “UN” when sending them to the remote system.

By default EA proposes the transfer syntax as it is found in the stored image file and the default transfer syntax. (Note what is referred to, as ‘the default transfer’ can be more than one transfer syntax. By default Explicit Little Endian and Implicit Little Endian are used as ‘default transfer syntax’).

For compressed images this leads to the following situation. An image is stored in EA with JPEG lossless or lossy compression (either because it was sent compressed, or because it was compressed by CA upon reception). When sending this image, the first proposed Transfer Syntax by EA is the transfer syntax of the image: JPEG lossless or JPEG lossy. If the client does not support the required JPEG Transfer Syntax, the image will be decompressed before it is sent.

3.1.2.3 Remote Basic Worklist Management SCP

3.1.2.3.1 Associated Real World Activity

The prefetch/routing mechanism queries an external system, e.g. a RIS, to determine which priors must be prefetched and routed.

3.1.2.3.2 Proposed Presentation Contexts

Presentation Context Table for Modality Worklist Management					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.3.3 SOP Specific Conformance Statement for SOP Class Modality Worklist Management

CA provides standard conformance.

By default the following returned keys for the Modality Worklist Management are used:

Used keys for Modality Worklist Management			
Module	Description	Tag	Type
Patient Identification	Patient's Name[1]	(0010,0010)	O
	Patient ID	(0010,0020)	R
Study Identification	Study Status ID[1]	(0032,000A)	O

[1]) These fields are optional and configurable. Shown are the defaults.

CA may fill all attributes in the query request with an empty value. The following types of attribute matching are used:

- Single Value Matching
- Universal Matching
- Wildcard Matching

3.1.2.4 Remote Query/Retrieve SCP (Query Spanning)

3.1.2.4.1 Associated Real World Activity

EA is used as a gateway for other Application Entities in the sense that queries on EA return information on instances present in EA *and* in the Application Entities for which EA is used as a gateway.

3.1.2.4.2 Proposed Presentation Contexts

Presentation Context Table for Remote Database Query					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/ Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/ Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
Patient/Study only Query/ Retrieve – FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.4.3 SOP Specific Conformance Statement for SOP Class Query

Standard conformance is provided.

When the query-spanning feature is enabled, EA will forward queries to one or more remote DICOM database(s). EA will forward the query unmodified, so it is the querying client that identifies the tags used in this request.

When the move-forwarding feature is disabled, the results are sent unaltered to the querying client. When the move-forwarding feature is enabled, the results are modified: the Retrieve AE title (0008, 0054) is changed into the AE title of the EA archive that is queried.

When the maximum number of query results is reached (see Query SCP 3.1.3.3), EA sends a C-CANCEL request to the remote DICOM database(s) and aborts the query.

3.1.2.5 Remote Query/Retrieve SCP (Move-forwarding)

3.1.2.5.1 Associated Real World Activity

EA is used as a gateway for other Application Entities in the sense that queries on EA return information on instances present in EA *and* in the Application Entities for which EA is used as a gateway. Furthermore instances that are present in the other Application Entities can be retrieved as if they where stored locally in EA.

3.1.2.5.2 Proposed Presentation Contexts

Presentation Context Table for Remote System Retrieve					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/ Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/ Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
Patient/Study only Query/ Retrieve – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.5.3 SOP Specific Conformance Statement for SOP Class Query

Standard conformance is provided.

If the move-forwarding feature is enabled for a remote DICOM database, the query results for that remote DICOM database will be modified such that the Retrieve AE title (0008, 0054) contains the AE title of the EA archive that is queried.

3.1.2.6 Remote Storage Commitment SCP

3.1.2.6.1 Associated Real World Activity

For instance transfers that are initiated by EA (see 3.1.2.2.), EA can optionally request storage commitment.

3.1.2.6.2 Proposed Presentation Contexts

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

3.1.2.6.3 SOP Specific Conformance Statement for SOP Class Storage Commitment Push Model

Standard conformance is provided.

If storage commitment is enabled for a remote system, EA will, after sending the instances to the remote system, issue a storage commitment request (N-ACTION). After that EA closes the association. Since EA does not wait for a reply from the SCP, the N-EVENT-REPORT must occur on a different association.

If the N-EVENT-REPORT indicates that the images are successfully stored, EA considers the transfer successfully completed. If, however, the N-EVENT-REPORT indicates that the instances are not successfully stored, EA will resend the images to the remote system and reissue the storage commit request. If the maximum number of retries is reached, EA will mark the transfer as failed.

3.1.3 Association Acceptance Policy

CA accepts associations for the following activities:
- Verification of the DICOM communication between a remote system and CA (3.1.3.1).
- Transfer of instances from a remote system to CA (3.1.3.2).
- Processing of a query from a remote system (3.1.3.3).
- Initiation of a transfer of images to a remote system when a retrieve request is received (3.1.3.4).
- Processing of a storage commit request from a remote system (3.1.3.5).
- Processing a Study Management update notification (3.1.3.6).

CA rejects association requests from applications of which the AE Title is not registered within EA's administration. The same applies to the case where the remote system uses a wrong AE Title to connect with CA.

A per archive registration specifies which services are available to a remote system. If the remote system is not listed in the registration of the archive it is connecting to the association is declined. After successful association setup, the remote system can access the services specified.

3.1.3.1 Remote Verification SCU

3.1.3.1.1 Associated Real World Activity

A remote system verifies its ability to communicate with EA by sending a C-ECHO request.

3.1.3.1.2 Accepted Presentation Contexts

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

3.1.3.1.3 SOP Specific Conformance Statement for SOP Class Verification

Standard conformance is provided.

3.1.3.1.4 Presentation Context Acceptance Criterion

The shown presentation context above is always accepted.

3.1.3.2 Remote Storage SCU

3.1.3.2.1 Associated Real World Activity

A remote system sends instances to CA. Once the transfer is completed the new instances are stored in EA and can be queried for.
If EA has been configured to store asynchronously, see 3.1.3.2.3, the storage and hence the query possibility is delayed.

3.1.3.2.2 Accepted Presentation Contexts

Presentation Context Table for Receive from Remote System				
Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
Default Application SOP Classes	See § 1.6.2	See below	SCP	None

Transfer Syntaxes for Receive from Remote System	
Name	UID
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
Explicit VR, Lossy JPEG 8-Bit Image Compression	1.2.840.10008.1.2.4.50
Explicit VR, Lossy JPEG 12-Bit Image Compression	1.2.840.10008.1.2.4.51
Explicit VR, JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70

3.1.3.2.3 SOP Specific Conformance Statement for SOP Class Storage

EA conforms to the full (level 2) conformance of the Storage SOP class. All Type 1, Type 2 and Type 3 attributes will be retained. In addition private attributes will be stored and included when the instance is sent out again.

Upon receival, images can be compressed. Based on user defined rules, an image can be stored uncompressed, JPEG Lossless compressed or with JPEG Lossy compression. Images that are already lossy compressed, or were lossy compressed in the past (which can be derived from the value “01” from tag (0028, 2110)) cannot be lossy compressed again. When images are lossy compressed, the value of tag (0028, 2110) is set to “01”.

Upon successful storage of images of a study or series it may automatically be transferred to another system, using Auto-routing.

For unsuccessful storage requests CA returns one of the following error status codes in synchronous mode:

Error code	Description	DICOM definition
0106	Invalid attribute value	PS 3.7 C.5.11
0110	Processing failure	PS 3.7, C.5.21
0111	Duplicate SOP instance	PS 3.7, C.5.8
0115	Invalid argument value	PS 3.7, C.5.10
0120	Required Attribute missing	PS 3.7 C.5.13
0122	Refused: SOP class not supported	PS 3.7, C.5.6
A701	Out of resources	PS 3.4, B.2.3
A901	Data set does not match SOP class (invalid image)	PS 3.4, B.2.3
FE00	Operation Cancelled	PS 3.7, C.3

EA can be configured to store a study asynchronously. In this case some of the above failures might not be returned. Storage commitment must be used to verify the storage of an instance. This configuration is unsuited in deployments where re-archiving is part of the workflow, because the storage commitment model does not support the verification of versions of instances in EA.

3.1.3.2.4 Presentation Context Acceptance Criterion

The first Presentation Context requested by the client, and supported by CA, is accepted.

3.1.3.3 Remote Query/Retrieve SCU (Query)

3.1.3.3.1 Associated Real World Activity

A remote system wants to obtain a list of the instances present in EA system and issues a query.

3.1.3.3.2 Accepted Presentation Contexts

Presentation Context Table for local Database Query					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/ Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/ Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study only Query/ Retrieve – FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.3.3 SOP Specific Conformance Statement for SOP Class Query

A query that is handled by EA returns data that is retrieved from the SQL database that contains the EA patient demographics. Fieldnames in this database are equivalent to the DICOM tags. Each field in the database can be queried for. Additional fields can be added to this database. By default, the following fields are present in the database.

Supported keys for Patient Root Query/Retrieve			
Level	Description	Tag	Type
Patient	Patient's Name	(0010,0010)	R
Patient	Patient ID	(0010,0020)	U
Patient	Patient's Birth Date	(0010,0030)	O
Patient	Patient's Sex	(0010,0040)	O
Patient	Other Patient ID	(0010,1000)	O
Study	Study Date	(0008,0020)	R
Study	Study Time	(0008,0030)	R
Study	Accession Number	(0008,0050)	R
Study	Study ID	(0020,0010)	R
Study	Study Instance UID	(0020,000D)	U
Study	Char. Set	(0008,0005)	O
Study	Modality in Study	(0008,0061)	O
Study	Institution Name	(0008,0080)	O
Study	Referring Physician's Name	(0008,0090)	O
Study	Station Name	(0008,1010)	O
Study	Study Description	(0008,1030)	O
Study	Institution Dep. Name	(0008,1040)	O
Study	Pref. Phys.	(0008,1050)	O
Study	Read Phys.	(0008,1060)	O
Study	Issuer of Patient ID	(0010,0021)	O
Study	Number of Study related Series	(0020,1206)	O
Study	Number of Study related Images	(0020,1208)	O
Study	Series in Study	(0020,1000)	O
Study	Study Status ID	(0032,000A)	O

Study	Reason for Study	(0032,1030)	O
Series	Modality	(0008,0060)	R
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Series Description	(0008,103E)	O
Series	Body Part Examined	(0018,0015)	O
Series	Protocol Name	(0018,1030)	O
Series	Frame of reference UID	(0020,0052)	O
Series	Images in Acquisition	(0020,1002)	O
Series	Number of Series related Images	(0020,1209)	O
Image	Image Number	(0020,0013)	R
Image	SOP Instance UID	(0008,0018)	U
Image	Transfer syntax UID	(0002,0010)	O
Image	Image Type VR:CS, VM:1-n	(0008,0008)	O
Image	SOP class UID	(0008,0016)	O
Image	Imager Pixel Spacing	(0018,1164)	O
Image	Cassette Orientation	(0018,1402)	O
Image	Cassette Size	(0018,1403)	O
Image	Acquisition Number	(0020,0012)	O
Image	Image Position (Patient)	(0020,0032)	O
Image	Image Orientation (Patient)	(0020,0037)	O
Image	Slice Location	(0020,1041)	O
Image	Photometric Interpretation	(0028,0004)	O
Image	Number of Frames	(0028,0008)	O
Image	Rows	(0028,0010)	O
Image	Columns	(0028,0011)	O
Image	Pixel Spacing	(0028,0030)	O
Image	Pixel Aspect Ratio	(0028,0034)	O
Image	Bits Allocated	(0028,0100)	O
Image	Pixel Representation	(0028,0103)	O
Image	Window Center	(0028,1050)	O
Image	Window Width	(0028,1051)	O
Image	Rescale Intercept	(0028,1052)	O
Image	Rescale Slope	(0028,1053)	O
Image	Rescale Type	(0028,1054)	O
Image	Window Explanation	(0028,1055)	O

Attributes for the Series and Image Level of the Study Root Query/Retrieve Information Model are the same as the Attributes for the Series Level of the Patient Root Query/Retrieve Information Model.

The following types of attribute matching are supported:

- Single Value Matching
- Universal Matching
- Wild Card Matching
- Range Matching
- Sequence Matching

For optimal support of Structured Reporting, the following tags should be added to the image table (via the Management Console). When added, they can be used for querying.

Additional keys for Structured Reporting			
Level	**Description**	**Tag**	**Type**
Image	Completion Flag	(0040, A491)	O
Image	Verification Flag	(0040, A493)	O
Image	Verifying Observer Sequence	(0040, A073)*	O

*) When this tag is added, EA can be queried for the tags (0040, A027) Verifying Organization, (0040, A030) Verification Date Time, (0040, A075) Verifying Observer Name, and (0040, A088) Verifying Observer Identification Code Sequence.

EA limits the number of query results to a configurable maximum. The default is 500.

Incoming queries can be modified to restrict the number of results. These restrictions can be configured via the Management Console. For instance only studies from the last week are returned.

EA supports the C-CANCEL request during a query operation.

When querying at image level, a number of private tags can be used. An overview is given in the next table.

Query Private Attributes					
Attribute Name	**Tag**	**Type**	**VR**	**VM**	**Attribute Description**
Block descriptor	(3113, 00xx)	3	LO	1	Applicare/Application/Version 1.0
State	(3113, xx11)	3	LO	1	Image state: 1= Writable 2= Read-only 3= Frozen 4= Archived 5= Out-of-Cache 6= Remote (only applicable if query spanning enabled)
Image State	(3113, xx51)	3	CS	1	Defined term with value: WRITABLE READ-ONLY OUT-CACHE REMOTE (only applicable if query spanning enabled)
ByteSize	(3113,xx16)	3	FD	1	Image size in bytes
Source	(3113,xx1A)	3	LO	1	Image Source

3.1.3.3.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance and prioritization of presentation contexts. EA accepts presentation contexts that match those listed in the table in section 3.1.3.3.2.

No verification is performed to ensure that a query contains all required tags.

3.1.3.4 Remote Query/Retrieve SCU (Retrieve)

3.1.3.4.1 Associated Real World Activity

A remote system wants to retrieve instances stored on CA and issues a retrieve command.

3.1.3.4.2 Accepted Presentation Contexts

Presentation Context Table for local Database Query					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/ Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/ Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/ Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/ Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Study Only Query/ Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Study Only Query/ Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.4.3 SOP Specific Conformance Statement for SOP Class Retrieve

Standard conformance is provided.

In addition to this, EA offers relational retrieve whereby for the Patient Root Query/Retrieve Model all studies of a particular patient can be retrieved by providing a Patient ID. Also, for both the Patient Root Query/Retrieve Model and the Study Root Query/Retrieve Model, all images of a study/series can be retrieved by providing a Study/Series Instance UID.

The C-MOVE command can include a private tag to specify a preferred compression:

- The private block descriptor is:
  - Tag: (3109, 00xx)
  - VR: LO
  - Value is “Applicare/RadWorks/Version 5.0”
- The specified tag is:
  - Tag: (3109, xx34)
  - VR: LO
  - Value: Can contain a defined value: “JPEG LL”. When present, all instances sent during that C-MOVE request are JPEG Lossless compressed before they are sent to a client.

EA supports a C-CANCEL request during a retrieve operation.

If the destination AE Title of a C-MOVE is the AE Title of EA itself, the request is interpreted as a prefetch request, and the required images are added to the prefetch queue.

3.1.3.4.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance and prioritization of presentation contexts.

3.1.3.5 Remote Storage Commitment SCU

3.1.3.5.1 Associated Real World Activity

After sending instances to EA, a remote system wants to confirm the proper storage of these instances in EA. To this purpose the remote systems sends a storage commit request to EA.

3.1.3.5.2 Accepted Presentation Contexts

Presentation Context Table for Storage Commitment Push Model					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name	UID		Negotiation
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.5.3 SOP Specific Conformance Statement for SOP Class Storage Commitment Push Model

Standard conformance is provided.
Note that, although EA supports the storage of multiple versions of an instance, this model uses the instance UID to determine the identity of an instance.

EA will open a new association to the SCU for transmitting the N-EVENT-REPORT response to the storage commit inquirer.

By default, EA will commit images as soon as they are stored on short-term storage. However, EA can be configured to only commit images when they are stored on long-term media.

3.1.3.5.3.1 Operations

Stored images can only be deleted as long as they are not archived to long-term storage media. Once archived, EA can no longer delete images.

Committed images can be retrieved via the normal Query/Retrieve mechanism.

EA does not support the optional Storage Media File-Set ID & UID attributes.

3.1.3.5.3.2 Notifications

Upon receiving a storage commitment EA will first wait for a configurable interval (30 seconds by default).

After this initial wait, EA will verify that the instances are present in the system and, in most cases, send a storage commit responds to the inquirer.

However, EA will not send a storage commit responds if some of the instances are present in the system, but do not have the correct state. This can be the case when EA is configured to only commit storage for instances on long-term storage, and some of the requested instances

are not migrated yet. In this case EA will re-evaluated the storage commit request after the periodic migration process has executed.

To prevent an endless wait for storage commit, each storage commit request gets an expiry date. When a storage commit request expires, EA sends a storage commit response to the requesting AE. Instances present in the system with an incorrect state are reported as uncommitted.

EA does not support the optional Storage Media File-Set ID & UID attributes.

EA does not support the optional Retrieve AE Title (0008,0054).

3.1.3.5.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance and prioritization of presentation contexts.

3.1.3.6 Remote Study Management SCU

3.1.3.6.1 Associated Real World Activity

An Application Entity modifies a study that is stored in EA. The Application Entity sends a notification message (to EA) to ensure that the study stored in EA is also updated.

3.1.3.6.2 Accepted Presentation Contexts

Presentation Context Table for Storage Commitment Push Model					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Detached Study Management SOP class	1.2.840.10008.3.1.2.3.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.6.3 SOP Specific Conformance Statement for SOP Class Detached Study Management

Standard conformance is provided.

Study Update is the only event type that is handled by EA. The instances referenced by the event and stored in EA are updated accordingly.

3.1.3.6.4 Presentation Context Acceptance Criterion

There are no specific rules for acceptance and prioritization of presentation contexts.

3.2 Application DICOM Media Server AE

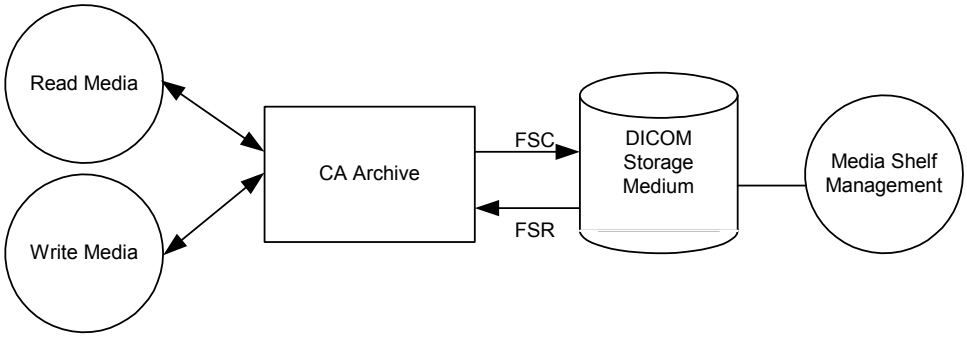
For long term storage EA supports the Media Storage Service Class for the Interchange of images as a File Set Reader (FSR) and File Set Creator (FSC). This section of the Conformance Statement describes the EA compliance to DICOM Media Interchange. It details the DICOM Media Storage Application Profiles and roles that are supported by this product.

EA provides capabilities to DICOM interchange on CD-Rs, DVD-R, and DVD-RAM.

When tape or MOD is used for data storage, the file system as provided by OTG is used. The files written on this file system are DICOM part 10. The file system is proprietary to OTG and outside the scope of this document.

3.2.1 Implementation Model

3.2.1.1 Application Data Flow Diagram



3.2.1.2 Functional definition of AE's

EA serves both as a FSC and a FSR. In this role EA is able to read directory information from the storage medium, to import images from the storage medium and to write images and directory information to the storage medium.

Within EA, information about all media is maintained in a media database. This database also provides the basis for Media Shelf Management.

3.2.1.3 Sequencing Requirements

Not applicable.

3.2.1.4 File Meta Information Options

The Implementation Class UID is 1.2.528.1.1001.2.20020315.1.

3.2.2 AE Specifications

3.2.2.1 EA Application Profile Specification

EA provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The application Profiles and Roles are listed in the following table:

Real World Activities and roles			
Supported Application Profiles	**Real World Activity**	**Role**	**SC Option**
STD-XABC-CD STD-XA1K-CD STD-GEN-CD STD-CTMR-CD STD-US-ID/SC/CC/-SF-xxxx	Read Media	FSR	Interchange
STD-AMI-CD/DVD	Read Media	FSR	Interchange
	Write Media	FSC	Interchange

For description of the STD-AMI-CD/DVD profile, see Section 3.3.3.

3.2.2.2 Real-World Activities

3.2.2.2.1 Read Media

CA will act as a FSR when reading images from the medium. This is done if a medium is imported into CA, or when images are prefetched from medium to RAID (e.g. for retrieval of the images).

The following mandatory attributes of the DICOM images are required for the correct import of the images in the CA database. They must be present, and have a non-empty value.

Mandatory keys in DICOM Part 10 files for importing		
IOD	**Field description**	**Tag**
PATIENT	Patient Name	(0010,0010)
PATIENT	Patient ID	(0010,0020)
STUDY	Study UID	(0020,000D)
SERIES	Series UID	(0020,000E)
IMAGE	Referenced SOP Class UID In File	(0004,1510)
IMAGE	Referenced SOP Instance UID In File	(0004,1511)
IMAGE	Referenced Transfer Syntax UID In File	(0004,1512)
IMAGE	Referenced File ID	(0004,1500)
IMAGE	Image Number	(0020,0013)

3.2.2.2.2 Write Media

CA will act as a FSC when writing images from the cache to long-term storage media. The STD-AMI-CD/DVD Application Profile will be used for writing these media.

3.3 Private Application Profiles: STD-AMI-CD/DVD

3.3.1 Class and Profile Identification

This section describes a class of Application Profiles used by CA. The identifier for this class shall be STD-AMI-CD/DVD. This purpose of this class is the interchange of Composite Images and Standalone SOP Instances via CD or DVD media for general-purpose applications. Instances from multiple modalities may be included on the same media.

Application Profile	Identifier	Description
General Purpose CD-R image interchange	STD-AMI-CD	Handles interchange of composite image SOP instances and SOP instances which conform to the model defined for standalone SOP Classes, such as Curves, etc.
General Purpose DVD-R or DVD-RAM	STD-AMI-DVD	Idem

3.3.2 Clinical Context

CA will create media with this profile to enable interchange of media between archives and/or workstations. When removed from a CA installation, virtually any Application Entity File Set Reader can read these media.

3.3.2.1 Roles and Service Class Options

3.3.2.1.1 File Set Creator

Only CA acts as a file set creator.

3.3.2.1.2 File Set Reader

The role of File Set Reader is used by Application Entities that receive a transferred File Set. Typical entities using this role would include archive systems or display workstations.
File Set Readers shall be able to read all the SOP Classes defined for this Application Profile, using all the defined Transfer Syntaxes.

3.3.2.1.3 File Set Updater

This role is not specified for this profile.

3.3.3 STD-AMI-CD/DVD Profile

3.3.3.1 SOP Classes and Transfer Syntaxes

This Application Profile is based on the Media Storage Service Class with the Interchange Option (See PS 3.4).

STD-AMI-CD/DVD SOP Classes and Transfer Syntaxes				
Information Object Definition	**Service Object Pair Class UID**	**Transfer Syntax and UID**	**FSC Requirement**	**FSR Requirement**
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian 1.2.840.10008.1.2.1	Mandatory	Mandatory
Default Application SOP Classes	See § 1.6.2	See below		

Transfer Syntaxes for SOP Instances on Media	
Name	**UID**
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
Explicit VR, Lossy JPEG 8-Bit Image Compression	1.2.840.10008.1.2.4.50
Explicit VR, Lossy JPEG 12-Bit Image Compression	1.2.840.10008.1.2.4.51
Explicit VR, JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70

CA writes the images in the transfer syntax used when they were stored. When storing, images can be compressed before they are stored. If this compress option is enabled, uncompressed images are compressed before they are stored, and hence the transfer syntax of the written images is Explicit VR, JPEG Lossy or Lossless.

3.3.3.2 Physical Medium and Medium Format

The STD-AMI-CD profile requires the 120 mm CD-physical medium with the ISO 9660 Media Format.
The STD-AMI-DVD profile requires the 120 mm DVD-physical medium with the UDF Media Format.

3.3.3.3 Directory Information in DICOMDIR

Conformant Application Entities shall include in the DICOMDIR File the Basic Directory IOD containing Directory Records at the Patient and the underlying Study and Series Levels, applicable to the SOP Classes in the File Set.
All DICOM files in the File Set that represent SOP instances defined for the specific Application Profile shall be referenced by Directory Records.

3.3.3.4 Additional Keys

File Set Creators are required to generate the mandatory elements specified in PS 3.3

File Set creators shall create DICOMDIR files for the DICOM Part 10 Volumes, containing the following keys:

Keys exported to the DICOMDIR File			
Directory Record Type	**Key description**	**Tag**	**Type**
PATIENT	Patient Name	(0010,0010)	2
PATIENT	Patient ID	(0010,0020)	1
STUDY	Study Date	(0008,0020)	1
STUDY	Study Time	(0008,0030)	1
STUDY	Accession Number	(0008,0050)	2
STUDY	Study Description	(0008,1030)	3
STUDY	Study Instance UID	(0020,000D)	1
STUDY	Study ID	(0020,0010)	1
STUDY	Accession Number	(0008,0050)	2
STUDY	Study UID	(0020,000D)	1C
SERIES	Modality	(0008,0060)	1
SERIES	Series UID	(0020,000E)	1
SERIES	Series Number	(0020,0011)	1
IMAGE	SOP Instance UID	(0008,0018)	1
IMAGE	Image Number	(0020,0013)	1

4 COMMUNICATION PROFILE

4.1 Supported Communication Stacks

CA provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 OSI Stack

Not supported.

4.3 TCP/IP Stack

CA uses the TCP/IP stack from the Microsoft Windows 2000™ operating system upon which it executes.

4.3.1 Physical Media Support

CA is not dependent on the physical medium over which the TCP/IP executes.

4.4 Point-to-Point Stack

Not supported.

5 EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

5.1 Standard Extended/Specialized/Private SOPs

Not applicable. No non-standard SOPs are defined or used.

5.2 Private Transfer Syntaxes

5.2.1 Private Transfer Syntax GE Compress Express

EA supports the following private transfer syntax:

Transfer Syntax	
Name	**UID**
COMPRESS_EXPRESS Transfer Syntax	2.16.840.1.113709.1.2.2

This private transfer syntax has been applied for EA to propose and accept the presentation syntaxes for all DICOM v3.0 Standards Storage SOP Classes that EA supports. It uses Explicit VR and Big Endian format for the data set encoding, and the GE proprietary CompressXpress™ and TruRez™ image compression algorithms for the pixel data compression. No pixel data encapsulation is applied.
It is expected that other vendors' applications will ignore all presentation contexts proposed with the COMPRESS_EXPRESS transfer syntax.
Instances are NOT persisted with this transfer syntax.

5.3 Unique identifiers and lossy compression.

To enable the traceability of instances within a PACS, EA can be configured NOT to change the UID of an instance at lossy compression. This should only be used in combination with a GE-PACS that relies on instance UIDs.
This configuration will be supported until CP309 has been approved.

6 CONFIGURATION

The configuration of the Application DICOM services is stored in the Windows NT™ Registry. Only accounts (secured by passwords) with the right level of security will be able to change the configuration. Typically support personnel does this.

6.1 Configurable Parameters

The following fields are configurable for EA:

- Local AE title, each archive has its own AE title
- Local listening port number, same for all AE titles in EA
- Local IP address
- Local IP netmask
- Maximum number of query results
- Maximum number of concurrent SCP associations
- Maximum number of concurrent SCU associations

The following fields are configurable for every remote DICOM AE:

- Remote AE title
- Remote listening port number
- Remote IP address
- Maximum PDU length
- Supported services per EA AE title. For instance, is this DICOM AE entitled to query a particular EA archive.
- Default transfer syntax used when instances are send to this DICOM AE
- Whether or not storage commitment is used when instances are send to this DICOM AE
- Time window that EA should use when communicating with this DICOM AE
- Number of retries and the period between each retry when EA fails to transfer instances to this DICOM AE
- Backup DICOM AE in case communication with the DICOM AE fails (even after multiple retries)

The following fields are configurable:

- Association operation inactivity timer
- Storage Commit request timeout
- EA can validate that association request of a specific AE are coming from a specific IP address. A configuration option turns this checking on or off.
- EA can validate incoming DICOM messages to see if the messages conform to the DICOM standard. A configuration option turns this checking on or off.

7 SUPPORT OF EXTENDED CHARACTER SETS

CA offers support for both single- and multi-byte character sets.
The implementation level is ISO 2022 Level 4 – Re-designation of Graphic Character Sets within a Code (Code level identifier 14).

The following table shows all default supported character sets. Additional support can be added by adding customer specific character mapping files.

Default Single-byte Character Sets

Character Set Description	Defined Term	ISO registration number	# of char	Code element	Character Set
Default repertoire	None	ISO-IR 6	94	G0	ISO 646:
Latin alphabet No. 1	ISO_IR 100	ISO-IR 100	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Latin alphabet No. 2	ISO_IR 101	ISO-IR 101	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Latin alphabet No. 3	ISO_IR 109	ISO-IR 109	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Latin alphabet No. 4	ISO_IR 110	ISO-IR 110	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Cyrillic	ISO_IR 144	ISO-IR 144	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Arabic	ISO_IR 127	ISO-IR 127	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Greek	ISO_IR 126	ISO-IR 126	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Hebrew	ISO_IR 138	ISO-IR 138	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Latin alphabet No. 5	ISO_IR 148	ISO-IR 148	96	G1	Supplementary set
		ISO-IR 6	94	G0	ISO 646:
Japanese	ISO_IR 13	ISO-IR 13	94	G1	JIS X 0201: Katakana
		ISO-IR 14	94	G0	JIS X 0201: Romaji

Default Multi-byte Character Sets

Character Set Description	Defined Term	ISO registration number	# of char	Code element	Character Set
Japanese	ISO 2022 IR87	ISO-IR 87	94^2	G0	JIS X 0208 Kanji
	ISO 2022 IR 159	ISO-IR 159	94^2	G0	JIS X 0212 Supplementary Kanji set
Korean	ISO-2022 IR 149	ISO-IR 149	94^2	G1	KS X 1001 Hangul and Hanja