DICOM

Conformance Statement

Xcelera R1.2.L4

PHILIPS

1. DICOM CONFORMANCE STATEMENT OVERVIEW

Xcelera is the Philips Cardiology multi-modality image and information management solution that allows images, information and reports to be reviewed, stored and distributed throughout the cardiology department and beyond.

Xcelera is a member of the Vequion family of products, solutions and professional services.

Xcelera provides the following DICOM data exchange features:

- It receives images sent to it by remote systems (e.g. workstations) and stores them in a local database.
- It allows the operator to copy images from the local database to remote databases and vice versa. For this purpose the operator is able to query remote databases.
- It allows a remote system to query the Xcelera database and to retrieve images from it.
- It allows the operator to print images stored in the Xcelera database on a DICOM printer.
- It is able to read and write DICOM CD-R disks.
- It is able to read and write DICOM DVD disks.

The following table lists the provided network services.

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Transfer			
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes (Note 1,2)	Yes (Note 1)
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Yes (Note 1,2)	Yes (Note 1)
Query/Retrieve			
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	No	Yes
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	No	Yes
Workflow Management			
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	Yes
Print Management			
Basic Film Session	1.2.840.10008.5.1.1.1	Yes	No
Basic Film Box	1.2.840.10008.5.1.1.2	Yes	No
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Yes	No
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	Yes	No
Print Job	1.2.840.10008.5.1.1.14	Yes	No
Basic Annotation Box	1.2.840.10008.5.1.1.15	Yes	No
Printer	1.2.840.10008.5.1.1.16	Yes	No
Verification			
Verification	1.2.840.10008.1.1	Yes (Note 2)	Yes

Notes: 1 Only for compatibility with NEO Ultrasound device
2 Only in case of connection to DICOM Archive (Archive AE)

The following table lists the Supported Media Storage Application Profiles (with roles).

Table 2: Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk – Recordable		
General Purpose CD-R Interchange	Yes	Yes
Basic Cardiac X-Ray Angiographic Studies	Yes	Yes
1024 X-Ray Angiographic Studies	Yes	Yes
Image Display (Ultrasound SF)	Yes	Yes
Image Display (Ultrasound MF)	Yes	Yes
Spatial Calibration (Ultrasound SF)	Yes	Yes
Spatial Calibration (Ultrasound MF)	Yes	Yes
Combined Calibration (Ultrasound {SF|MF})	Yes	Yes
CT/MR Studies	Yes	Yes
DVD		
General Purpose DVD-RAM Interchange	Yes	Yes
Basic Cardiac X-Ray Angiographic Studies	Yes	Yes
1024 X-Ray Angiographic Studies	Yes	Yes
Image Display (Ultrasound SF)	Yes	Yes
Image Display (Ultrasound MF)	Yes	Yes
Spatial Calibration (Ultrasound SF)	Yes	Yes
Spatial Calibration (Ultrasound MF)	Yes	Yes
Combined Calibration (Ultrasound {SF|MF})	Yes	Yes
CT/MR Studies	Yes	Yes

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3. INTRODUCTION

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

Document Version	Date of Issue	Author	Description
0.0	16 Feb. 2007	CTO, C&S-IC2	Preliminary version of the DICOM Conformance Statement for Xcelera R1.2.L4.

3.2. Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
  It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- **Validation**
  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the

responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.
  The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.
The word Philips in this document refers to Philips Medical Systems.

The following acronyms and abbreviations are used in this document.

ACC	American College of Cardiology
ACR	American College of Radiology
AE	Application Entity
AETitle	Application Entity Title
ALWAYS	Always Present
ANAP	Attribute Not Always Present
ANSI	American National Standard Institute
AP	Application Profile
API	Application Programming Interface
AUTO	The attribute value is generated automatically
BMP	Bitmaps
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-M	CD-Medical
CONFIG	The attribute value source is a configurable parameter
CR	Computed Radiography
CT	Computed Tomography
DCR	Dynamic Cardio Review
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
DNS	Domain Name System
DSR	Digital Storage and Retrieval
DSR-TIFF	Digital Storage and Retrieval – the proprietary Philips Ultrasound image file format that predates DICOM
DVD	Digital Versatile Disc
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian

EMPTY	Attribute is sent without a value
FIFO	First In First Out
FLOP	Floppy disk
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
FTP	File Transfer Protocol
GUI	Graphic User Interface
HIS	Hospital Information System
HIPAA	Health Insurance Portability and Accountability Act.
HL7	Health Level Seven
HTML	HyperText Markup Language
ID/SC	Image Display/Spatial Calibration
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
IP-address	Internet Protocol address
ISIS	Information System – Imaging System
JPEG	Joint Photographic Experts Group
JPEG	Losless FOP
	JPEG Lossless, Non-Hierarchical, First-Order Prediction (process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression.
JPEG	Lossy Baseline
	JPEG Baseline (Process 1): Default Transfer Syntax for lossy JPEG 8 Bit Image Compression
MIME	Multipurpose Internet Mail Extension
MOD	Magneto-Optical Disk
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine
NSF	National Science Foundation
PACS	Picture Archiving and Picture Communication System
PDU	Protocol Data Unit
PPP	Point to Point Protocol
Q/R	Query/Retrieve
RF	X-Ray Radiofluoroscopic
RIS	Radiology Information System
RLE	Run Length Encoding
RP	Response
RQ	Request
RT	Radiotherapy
RWA	Real-World Activity
SC	Secondary Capture
SCM	Study Component Management
SCP	Service Class Provider
SCU	Service Class User
SF/MF	Single Frames/Multi Frames
SOP	Service Object Pair
STD-GEN	General Purpose Image Exchange profile class
STD-US	Application profile for Ultrasound media storage application
STD-XABC	Application profile class for Basic Cardiac X-ray Angiographic clinical application
STD-XA1K	Application profile for 1024 X-ray Angiographic clinical application
TCP/IP	Transmission Control Protocol/Internet Protocol
TTL	Time to Live

UID   Unique Identifier
US   Ultrasound
USER   The attribute value source is from User input
USMF   Ultrasound Multi-frame
VNAP   Value Not Always Present
WLM   Worklist Management
XA   X-Ray Angiographic

3.5.   References

[DICOM]   Digital Imaging and Communications in Medicine (DICOM), Part 1 – 18
                (NEMA PS 3.1 – PS 3.18),
                National Electrical Manufacturers Association (NEMA)
                Publication Sales 1300 N. 17th Street, Suite 1847
                Rosslyn, Virginia. 22209, United States of America

4. NETWORKING

This section contains the networking related services (vs. the media related ones).

4.1. Implementation model

4.1.1. Application Data Flow

As part of the implementation model, an application data flow diagram is included. This diagram represents all of the Application Entities present in an implementation, and graphically depicts the relationship of the AE's use of DICOM to Real-World Activities as well as any applicable user interaction.
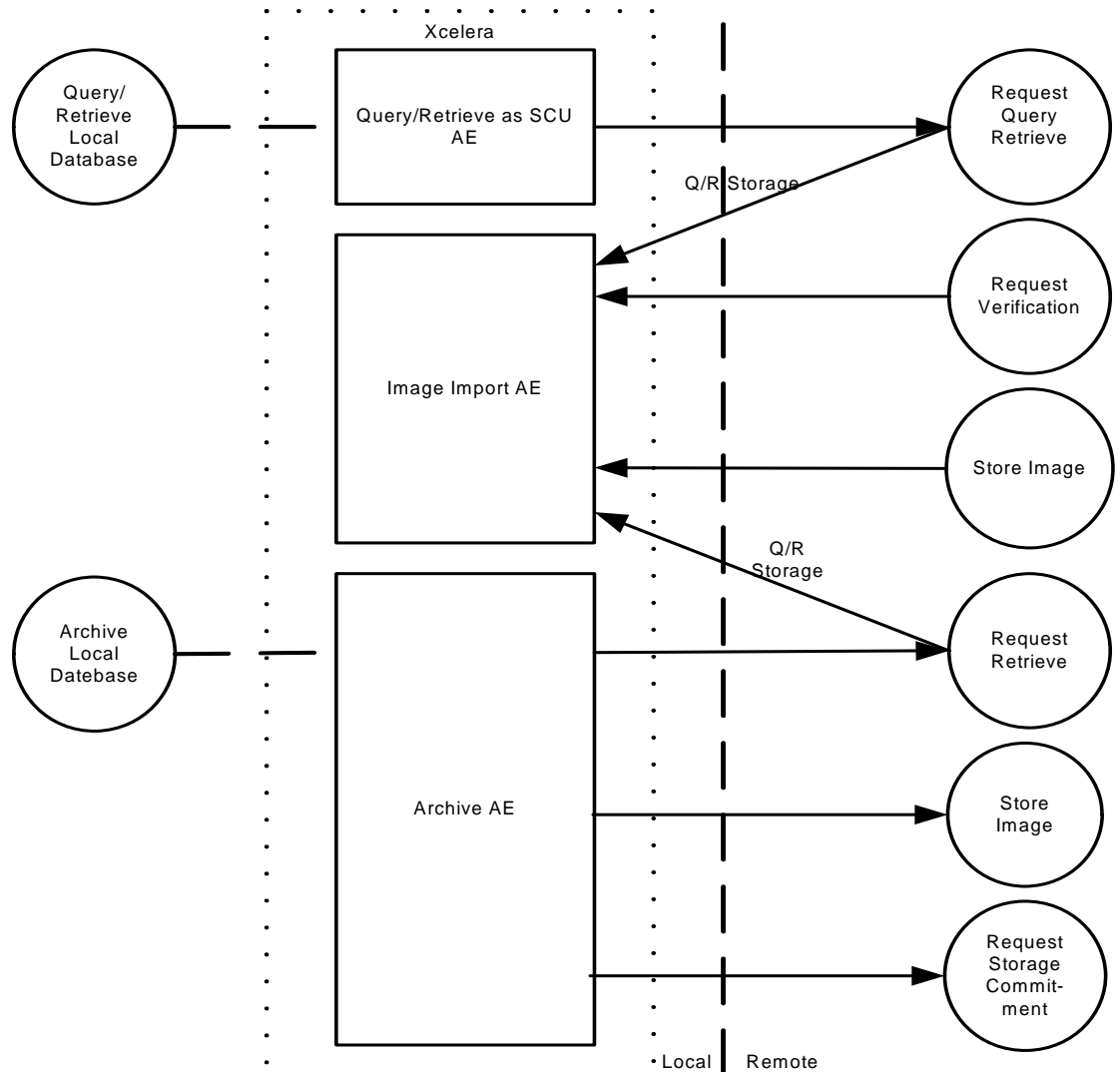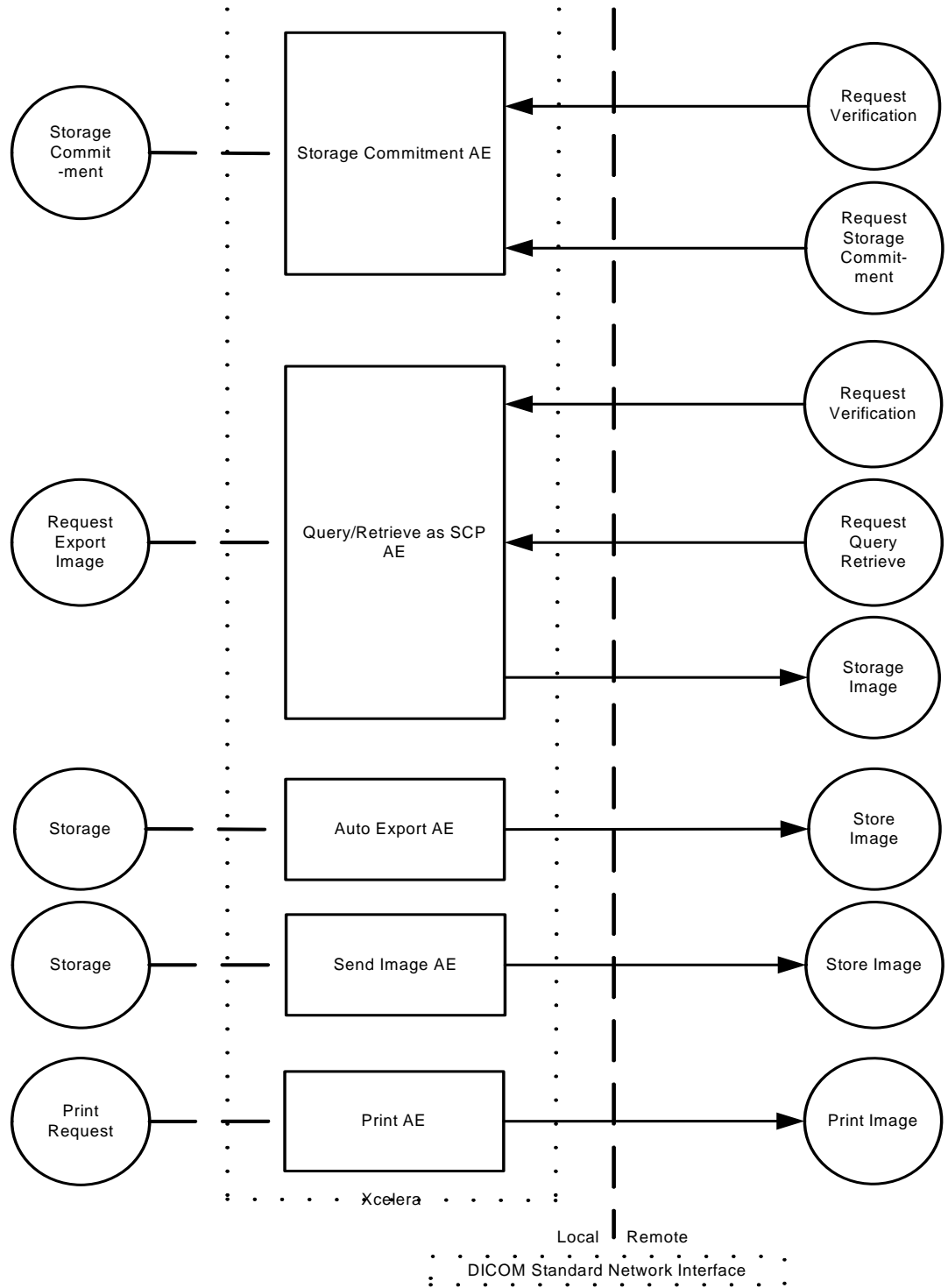
Figure 1: Application Data Flow Diagram

4.1.2. Functional Definition of AE's

This part contains the functional definition for each individual local Application Entity. This described in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as Association Services.

4.1.2.1. Functional Definition of Xcelera Imaging Import AE

Xcelera (SCP) accepts an association with a remote DICOM AE (SCU) to receive a storage request and the applicable image data. (DICOM Storage Service Class)

4.1.2.2. Functional Definition of Xcelera Storage Commitment AE

Xcelera (SCP) accepts an association with a remote DICOM AE (SCU) to receive a storage commitment request. After handling the requested storage commitment, Xcelera initiates an association with the SCU to report the status of the storage commitment. (DICOM Storage Commitment Service Class)

4.1.2.3. Functional Definition of Xcelera Auto Export AE

On event, Xcelera (SCU) automatically initiates an association with a remote DICOM AE (SCP) to send a storage request and the applicable image data. (DICOM Storage Service Class)

4.1.2.4. Functional Definition of Xcelera Send Images AE

When the Send function in Xcelera is addressed, Xcelera (SCU) initiates an association with a remote DICOM AE (SCP) to send a storage request and the applicable image data. (DICOM Storage Service Class).

4.1.2.5. Functional Definition of Xcelera Query/Retrieve as SCU AE

Xcelera (SCU) initiates an association with a remote DICOM AE (SCP) to send a Query/Retrieve request. (DICOM Query/Retrieve Service Class).

4.1.2.6. Functional Definition of Xcelera Query/Retrieve as SCP AE

Xcelera Query/Retrieve as SCP AE exists of two functions.
- Xcelera (SCP) accepts an association with a remote DICOM AE (SCU) to receive a Query/Retrieve request. (DICOM Query/Retrieve Service Class)
- When a retrieve of image data is requested, Xcelera (SCU) initiates an association with a remote DICOM AE (SCP) to send a storage request and the applicable image data. (DICOM Storage Service Class).
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4.1.2.7. Functional Definition of Xcelera Archive AE

The Archive AE handle the communication between Xcelera and the PACS
For store images to the archive, an automatic function his own Storage with Storage Commitment function will be used. To pull the image from archive, a C-MOVE on Study Instance UID by the Store SCP handled this action. The result will be retrieved via the Import AE.

4.1.2.8.   **Functional Definition of Xcelera Print AE**

The Print AE in Xcelera supports the functionality for basic grayscale print management, basic annotation box, and print job.
On demand, Xcelera (SCU) initiates an association with a printer (SCP) and sends a create request to the printer. (DICOM Print Management Service Class).
A selection in the printer menu handled the print with or without annotation.

4.1.3. Sequencing of Real World Activities

All Real-World Activities as specified in the Functional Definition of Application Entities may occur independently from each other.

4.1.4. Deleting studies and images.

Delete of study's and images may and can only be done by authorized persons.

4.2. AE Specifications

The Network capabilities of Xcelera consist of eight DICOM Application Entities:
- Imaging Import AE (section 4.2.1)
- Storage Commitment AE (section 4.2.2)
- Auto Export AE (section 4.2.3)
- Send Image AE (section 4.2.4)
- Query/Retrieve as SCU AE (section 4.2.5)
- Query/Retrieve as SCP AE (section 4.2.6)
- Print AE (section 4.2.7)
- Archiving AE (section 4.2.8)

The last Application Entity is the Media AE, but this will be described in chapter 5 Media Interchange.

DICOM asynchronous mode is not supported, meaning that only one transaction may be outstanding over each association at any given point in time.

4.2.1. Imaging Import AE

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for Imaging Import AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	No	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	No	Yes (Note 1)
Private 3D Presentation State	1.3.46.670589.2.5.1.1	No	Yes (Note 1)

Note 1: Only for compatibility with NEO Ultrasound device
Note 2: Only for compatibility with Xcelera systems

4.2.1.2.   Association Policies

4.2.1.2.1. *General*

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Imaging Import AE is 28 Kbytes

Table 5: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2. *Number of Associations*

For the verification service only one association can be handled at a time.

Table 6: Number of Associations as an Association Acceptor for Imaging Import AE

Maximum number of simultaneous associations	Limit of system resources

4.2.1.2.3. *Implementation Identifying Information*

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 7: DICOM Implementation Class and Version for Imaging Import AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.1.3.   Association Initiation Policy

The Import Image AE never initiates any associations.

4.2.1.4.   Association Acceptance Policy

Each AE specification contains a description of the association acceptance policies of the AE. This describes the conditions under which the AE will accept an association.

4.2.1.4.1. *(Real-World) Activity – Verification (C-ECHO)*

4.2.1.4.1.1. Description and Sequencing of Activities

The Import Image AE accepts associations from systems that wish to verify application level communication using the C-ECHO command.
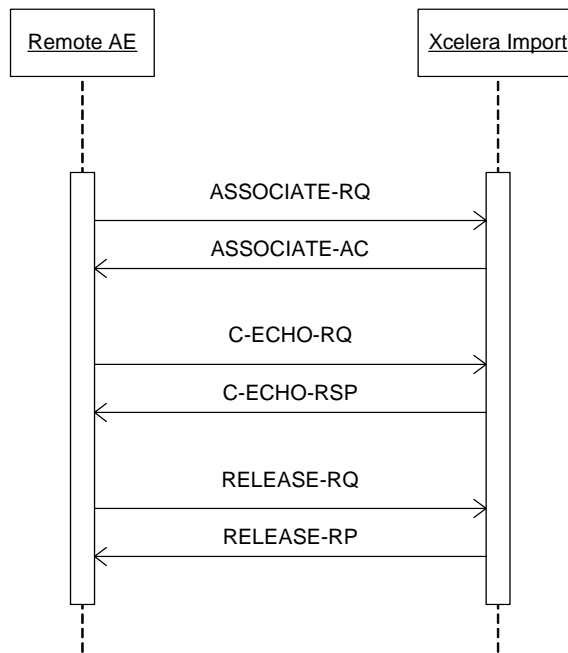
Figure 2: Sequence of RWA Import Image (C-ECHO)

4.2.1.4.1.2. Accepted Presentation Contexts

The Import Image AE accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Import Image AE will accept multiple proposed Presentation Contexts with the same SOP Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts

The Import Image AE will accept the presentation context as given in the next table

Table 8: Acceptable Presentation Contexts for (Real-World) Activity – Import Image Storage (C-ECHO)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.1.4.1.3. SOP Specific Conformance for SOP Classes

The Import Image AE provides standard conformance

4.2.1.4.2. (Real-World) Activity – Import Image Storage (C-STORE)

4.2.1.4.2.1. Description and Sequencing of Activities
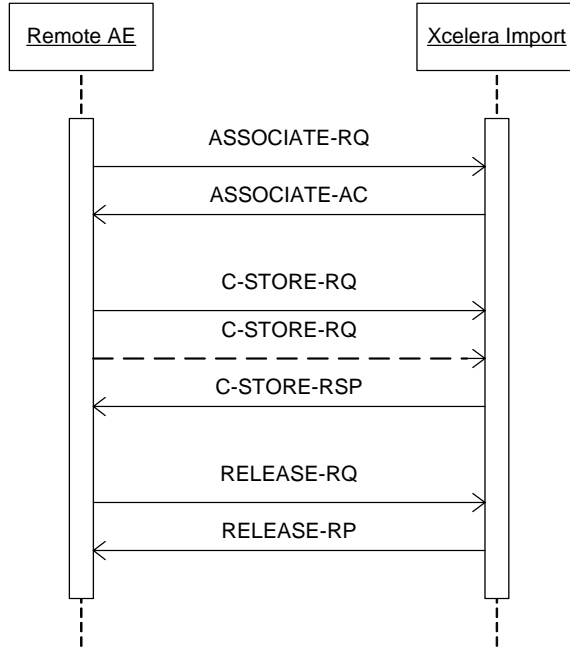
Figure 3: Sequence of RWA Import Image (C-STORE)

A remote system sets up an association with Xcelera. Xcelera verifies that the remote system is configured as an allowed SCU, and that the maximum number of associations is not already reached. If suitable, Xcelera will accept the association with a preferred presentation context. Then the remote system may transfer its image data to Xcelera. When the complete image has been received, Xcelera will send a C-STORE response to notify the remote system that the transfer is completed successfully and the remote system may release the association.

Import Image AE may reject association attempts as shown in table below. The Result, Source and Reason/Diag columns represent the values returned in the appropriate fields of an ASSOCIATE-RJ PDU.

Table 9: Association Rejection Reasons Import Image AE (C-STORE)

Result	Source DICOM UL	Reason/ Diag	Explanation
1-reject-permanent	1-service-user	1-no-reason-given	If reason not given
1-reject-permanent	1-service-user	2-application-context-name-not supported	Send by not supported application context name
1-reject-permanent	1-service-user	3-calling-AE-title not recognized	Send by wrong calling AE-title
1-reject-permanent	1-service-user	7-called-AE-title-not-recognized	Send by wrong called AE-title
1-reject-permanent	2-service-provider-(ACSE-related-function)	2-protocol-version-not supported	Send when protocol version not supported
	0- unknown	0- unknown	By Initiate abort
	2- service-provider-(ACSE-related-function)	0- unknown	By Initiate abort

4.2.1.4.2.2. Accepted Presentation Contexts

The following table illustrates the accepted presentation contexts for image storage requests. The Import Image AE accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Import Image AE will accept multiple proposed Presentation Contexts with the same SOP Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts.

Table 10: Acceptable Presentation Contexts for (Real-World) Activity – Import Image Storage (C-STORE)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossy Baseline JPEG Lossless FOP RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	JPEG Lossy Baseline JPEG Lossless FOP RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.5		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ILE ELE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ILE ELE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Private 3D Presentation State	1.3.46.670589.2.5.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Note: During the association negotiation the Xcelera accepts also presentation contexts for other Storage SOP classes. As soon as the remote system will start sending data for these storage SOP classes the Xcelera will Abort the connection.

Note: Comprehensive SR object from non Philips systems are not accepted by Xcelera. Xcelera will Abort the connection when a non Philips Comprehensive SR object is received.

4.2.1.4.2.3. SOP Specific Conformance for SOP Classes

Xcelera conforms to the SOP's of the Storage Service Class. Xcelera discards no data elements.

The following table lists the actions that are performed when an exception occurs; the C-STORE Status Responses that are returned by the Import Image AE are also mentioned.

Table 11: Import Image Storage (C-STORE) Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Operation successfull
Refused	Remote is not Licensed		Log; Abort association
Error	Abort by remote System		Log
	Time-out reached		Log; Abort association
	Internal error Xcelera	0110	Send notification; Log; Abort association
	Invalid dataset	A900	Send notification; Log

The images received by Xcelera are merged on Study UID and Series UID.
For ultrasound images only the Image Information Entity level is supported.

For the Imaging Import AE are on the required behavior the next exceptions:
1. Xcelera accept connection to a DICOM image system as the system is licensed.
2. Xcelera try to notify the DICOM image system about the reason occurs the not accepted setting up.
3. If no agreement between the two parties can be reached concerning (DICOM) communication parameters the connection will be closed and no data transfer will take place.
4. Xcelera will close the connection if no data is received inside 120 seconds after the setup.
5. If a network error occurs during set up of a connection or during image transfer, this is reported. Xcelera will abort the connection.
6. By errors during image transfer Xcelera will notify the DICOM image system and closed the connection.
7. Missing or empty mandatory DICOM Data. If Type 1 DICOM composite-object attributes are missing or empty then the system will:
   - Discard all data received for the associated object,
   - Return an appropriate DICOM error message to the DICOM image system making the store request,
8. If an object received has the same DICOM SOP Instance UID as an object already stored on Xcelera, Xcelera will do either of the following:
   - If the already stored object has the same UID's on instance, study and series level as the new one, Xcelera will replace the stored object with the new object. This will not be communicated to the DICOM image system, which will thus perceive this as a normal store

- If the already stored object has a different study or series UID as the new one; Xcelera will discard the object and send an error to the DICOM image system. The connection will remain open in order to allow the DICOM image system to recover from this error

The image will be accepted only if all the relevant mandatory attributes are available (defined in the DICOM standard as type 1 - present with a value).

Table 12: DICOM Type 1 attributes checked during storing of data objects

Attribute	Tag	VR	Presence	Non Empty Value
Study Instance UID	0020,000D	UI	Yes	Yes
Series Instance UID	0020,000E	UI	Yes	Yes
SOP Class UID	0008,0016	UI	Yes	Yes
SOP Instance UID	0008,0018	UI	Yes	Yes
Samples per Pixel	0028,0002	US	Yes	Yes
Rows	0028,0010	US	Yes	Yes
Columns	0028,0011	US	Yes	Yes
Bits Allocated	0028,0100	US	Yes	Yes
Bits Stored	0028,0101	US	Yes	Yes
High Bit	0028,0102	US	Yes	Yes
Photometric Interpretation	0028,0004	CS	Yes	Yes
Pixel Data	7FE0,0010	OW	Yes	Yes

Attribute with value representation of TIME will be transferred to time 00:00:00 during import when TIME value was empty.

Table 13: Store SCP Command Communication Failure Behavior

Exception	Behavior
Timeout	Time-out for reception is set fixed to 120 seconds.

4.2.2. Storage Commitment AE

4.2.2.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 14: SOP Classes for Storage Commitment AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	No	Yes

4.2.2.2. Association Policies

4.2.2.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Storage Commitment AE is 28 Kbytes.

Table 15: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2. Number of Associations

For the verification service only one association can be handled at a time.

Table 16: Number of Associations as an Association Acceptor for Storage Commitment AE

Maximum number of simultaneous associations	Limit of system resources

4.2.2.2.3. Implementation Identifying Information

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 17: DICOM Implementation Class and Version for Storage Commitment AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.2.3. Association Initiation Policy

This describes the conditions under which the AE will never initiate an association.

4.2.2.4. Association Acceptance Policy

4.2.2.4.1. *(Real-World) Activity – Storage Commitment AE*

4.2.2.4.1.1. Description and Sequencing of Activities
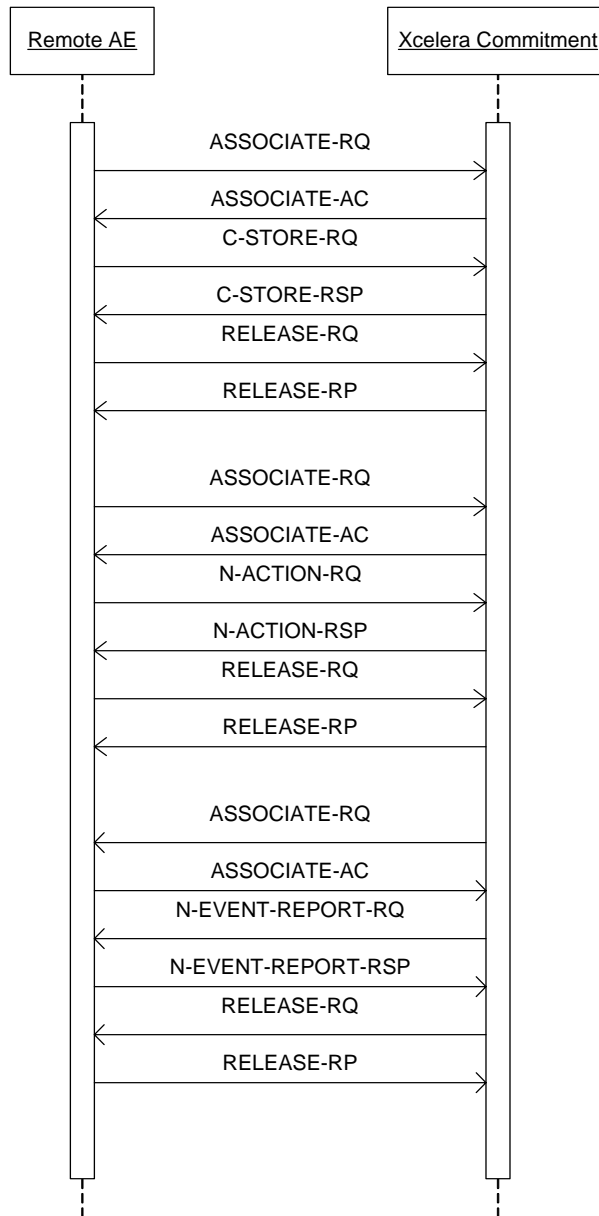
Figure 4: Sequence of RWA Storage Commitment

Xcelera will support DICOM Storage commitment as SCP, only for asynchronous workflow. The C-STORE, N-ACTION and N-EVENT-REPORT will be handled in a separate association.

4.2.2.4.2. (Real-World) Activity – Storage Commitment AE (N-ACTION)

4.2.2.4.2.1. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Storage Commitment AE for (Real-World) Activity – Storage Commitment AE are defined in next table.

Table 18: Proposed Presentation Contexts for (Real-World) Activity – Storage Commitment AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.2.4.2.2. SOP Specific Conformance for SOP Classes

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in next table.

Table 19: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	
Error	Out of resources	0110	

4.2.2.4.2.3. Storage Commitment Notifications (N-EVENT-REPORT)

4.2.2.4.2.4. Description and Sequencing of Activities

Storage Commitment AE may reject association attempts as shown following table. The Result, Source and Reason/Diag columns represent the values returned in the appropriate fields of an ASSOCIATE-RJ PDU.

Table 20: Association Rejection Reasons

Result	Source DICOM UL	Reason/ Diag	Explanation
	0-unknown	0- unknown	Abort before reason known
1-reject-permanent	1-service-user	1-no-reason-given	Normal abort of Association

4.2.2.4.2.5. Accepted Presentation Contexts

The Storage Commitment AE provides standard conformance to the Storage Commitment Push Model SOP class. The following table lists the actions that are performed when an exception occurs. The status responses that are returned by the Storage Commitment AE are also mentioned.

Table 21: Acceptable Presentation Contexts for (Real-World) Activity –Storage Commitment (N-EVENT-REPORT SCP)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.2.4.2.6. SOP Specific Conformance for SOP Classes

The Storage Commitment AE accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Storage Commitment AE will accept multiple proposed Presentation Contexts with the same SOP Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts.

Table 22: Storage Commitment (N-EVENT-REPORT SCP) Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	
Error	Processing Failure	0110	Send Notification; Log

In case that part of the images in a storage commitment request cannot be committed, the Storage Commitment AE reports a failure of the complete storage commitment request.

The Storage Commitment AE provides standard conformance to the Storage Commitment Push Model SOP Class.

The following N-EVENT-REPORT attributes are sent.

Table 23: N-EVENT-REPORT Attributes

Event Type Name	Event Type ID	Attribute	Tag	Note
Storage Commitment Request Successful	1	Transaction UID	(0008,1195)	-
		Referenced SOP Sequence	(0008,1199)	-
		>Referenced SOP Class UID	(0008,1150)	-
		>Referenced SOP Instance UID	(0008,1155)	-
Storage Commitment Request Complete - Failures Exist	2	Transaction UID	(0008,1195)	-
		Failed SOP Sequence	(0008,1198)	-
		>Referenced SOP Class UID	(0008,1150)	-
		>Referenced SOP Instance UID	(0008,1155)	-
		>Failure Reason	(0008,1197)	-

. For every storage commitment operation the following exceptions can happen:
- The storage commitment function supports at least 100 outstanding requests. When new requests cannot be handled due to resource problems, a DICOM error (out of resources) should be generated.
- The maximum time for the server to wait for a case to be moved to the repository is 8 hours. After this maximum time the system assumes it cannot archive the case and returns an error (negative response) on the commit request for that particular case.
- If the Storage Commitment SCP cannot set up a DICOM association when trying to send a storage commitment response, it will try sending this response for a configurable numbers (default 72) of times with one-hour intervals.

4.2.2.4.3. (Real-World) Activity – Storage Commitment (C-ECHO)

4.2.2.4.3.1. Description and Sequencing of Activities
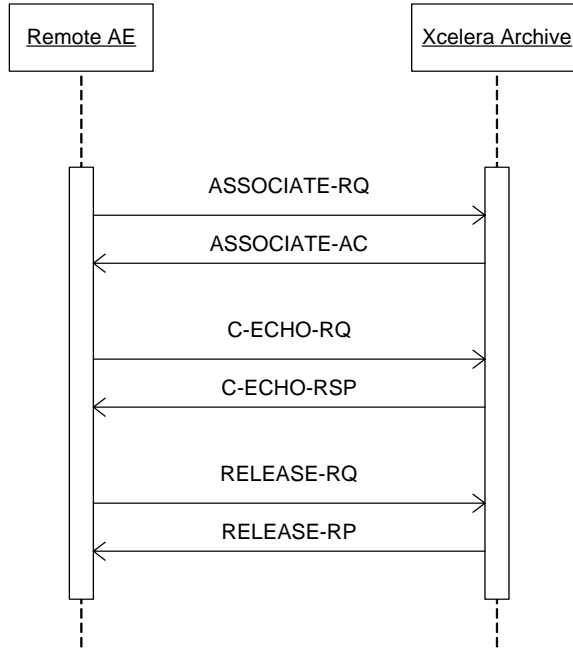
Figure 5: Sequence of RWA Storage Commitment (C-ECHO)

The Storage Commitment AE accepts associations from systems that wish to verify application level communication using the C-ECHO command.

4.2.2.4.3.2. Accepted Presentation Contexts
The Storage Commitment AE will accept the presentation context as given in the next table.

Table 24: Acceptable Presentation Contexts for Storage Commitment (C-ECHO)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.2.4.3.3. SOP Specific Conformance for SOP Classes
The Storage Commitment AE (C-ECHO) provides standard conformance.

4.2.3. Auto Export AE

4.2.3.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 25: SOP Classes for Auto Export AE

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Yes	N0

4.2.3.2. Association Policies

4.2.3.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Auto Export AE is 28 Kbytes.

Table 26: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2. Number of Associations

For the storage SCU service only one association can be active at a time.

Table 27: Number of Associations as an Association Initiator for Auto Export AE

Maximum number of simultaneous associations	Limit of system resources

4.2.3.2.3. Implementation Identifying Information

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 28: DICOM Implementation Class and Version for Auto Export AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4

Implementation Version Name	Xcelera R1.2.L4

### 4.2.3.3. Association Initiation Policy

This describes the conditions under which the AE will initiate an association.

4.2.3.3.1. (Real-World) Activity – Auto Export AE

4.2.3.3.1.1. Description and Sequencing of Activities
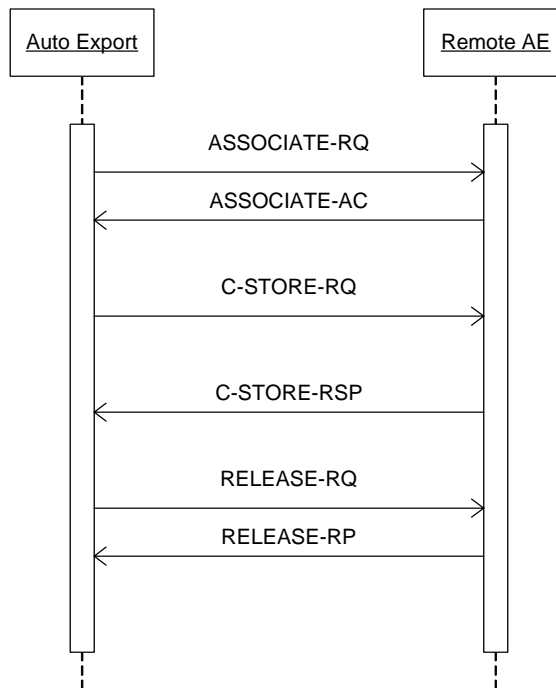
Figure 6: Sequence of RWA Auto Export AE

Normal flow of events:
1. Xcelera sets up a connection with the target DICOM node and negotiates communications parameters. If the two parties cannot agree on transfer using the data format stored on the server, Xcelera will negotiate an alternative DICOM transfer syntax and create a converted copy of the study data to be transferred.
2. Then Xcelera transfers its image data (complete study or SC only) to the target DICOM node Depending on configuration setting, Xcelera auto forwards studies completely, or only new deltas such as photo files or new images coming from an acquisition system.
3. Upon completion of this transfer, the connection is closed. Connection set up and tear down, and data transfer takes place according to the DICOM Store protocol defined as part of the DICOM 3.0 standard

4.2.3.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Auto Export AE for (Real-World) Activity – Auto Export AE are defined in next table

Table 29: Proposed Presentation Contexts for (Real-World) Activity – Auto Export AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1				
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Private 3D Presentation State	1.3.46.670589.2.5.1.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

Note: If Xcelera receives an object via ILE and exports it via ELE or EBE Xcelera need to determine the VR for the DICOM attributes. For the attributes (0018,1450), (300C,0008) and (300C,0009) the wrong VR is chosen.(CS or IS instead of DS)

Xcelera can perform a transfer syntax conversion according to the following table.

Table 30: Auto Store Transfer syntax conversion

Source Syntax	Destination Syntax		
	ILE	**ELE**	**EBE**
ILE	-	+	+
ELE	+	-	+
EBE	+	+	-
JPEG Losless FOP Non-Hierarchical 14	+	+	+
RLE	+	+	+

4.2.3.3.1.3. SOP Specific Conformance for SOP Classes

The behavior on successful and unsuccessful transfer of images is given in the table below.

Table 31: Auto Export AE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	
Warning	Coercion of data elements	B000	Log; Continue
	Elements discarded	B006	Log; Continue
	Data set does not match SOP class	B007	Log; Continue
Error	Processing failure	0110	Log; Release association; Release application; Retry to send the images
	Data set does not match SOP class	A900	Log; Release association; Release application; Retry to send the images.
	Cannot understand	C000	Log; Release association; Release application; Retry to send the images.
Refused	Out of resources	A700	Log; Release association; Release application; Retry to send the images.

The Exceptions to the normal functionality of the system:
1. If, after setting up the connection, no data can be sent to the external node for 60 seconds, Xcelera aborts the connection.
2. If an error occurs on Xcelera while setting up the connection, Xcelera aborts the connection. For data that cannot be recompressed to lossy format, a longer Time To Live (TTL) may be applied.
3. If an error occurs on the target node while setting up the connection. If the retries are unsuccessful, the system will mark the data for later.
4. If an error occurs on Xcelera during image conversion or image transfer, Xcelera will abort the auto forward. A final error will be reported.
5. If an error occurs on the target node during image transfer, results the connection to be aborted Xcelera will report this error.
6. An error or warning concerning data transfer is received from the target node during data transfer. If it is related to the data being send Xcelera tries to correct the cause of the error (e.g. by redoing the conversion). All information available on the error or warning will be reported.

4.2.3.4. Association Acceptance Policy

The Auto Export AE will never accepts any associations.

4.2.4. Send Image AE

Xcelera is capable of sending stored DICOM image data (studies) to other DICOM nodes, using the DICOM store protocols.

4.2.4.1.   SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 32: SOP Classes for Send Image AE

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Yes	No

4.2.4.2.   Association Policies

4.2.4.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Send Image AE is 28 Kbytes.

Table 33: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2. Number of Associations

For Xcelera is the maximum number of associations limited by the limit of the system resources. The license number of external DICOM nodes is one of these limits.

Table 34: Number of Associations as an Association Initiator for Send Image AE

Maximum number of simultaneous associations	5

4.2.4.2.3. *Implementation Identifying Information*

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 35: DICOM Implementation Class and Version for Send Image AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.4.3.   Association Initiation Policy

This session describes the conditions under which the AE will initiate an association.

4.2.4.3.1. *(Real-World) Activity – Send Image AE*

4.2.4.3.1.1. Description and Sequencing of Activities
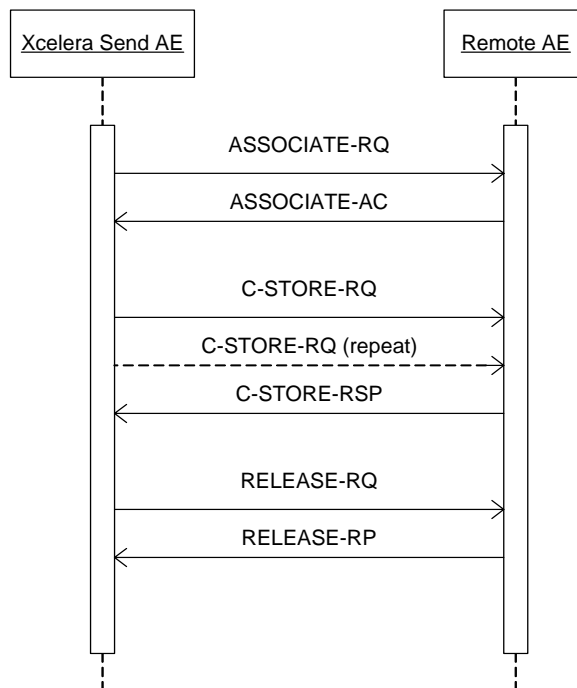
Figure 7: Sequence of RWA Send Image AE

Normal flow of events:
1. The user selects a study from the list of studies being displayed.
2. After selection of the external DICOM node, Xcelera sets up a store connection and negotiates communications parameters with this external DICOM node. Connection set up is executed according to the DICOM Store protocols, with Xcelera acting as a DICOM Store SCU.
3. After this connection is set up, Xcelera sends the user selected study to the external DICOM node. Upon completion of this, the connection is closed. Start and end of the connection and data transfer are logged.

4.2.4.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Send Image AE for (Real-World) Activity – Send Image AE are defined in next table.

Table 36: Proposed Presentation Contexts for (Real-World) Activity – Send Image AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1				
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Private 3D Presentation State	1.3.46.670589.2.5.1.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

Xcelera can perform a transfer syntax conversion according to the following table.

Table 37: Auto Store Transfer syntax conversion

Source Syntax	Destination Syntax		
	ILE	**ELE**	**EBE**
ILE	-	+	+
ELE	+	-	+
EBE	+	+	-
JPEG Losless FOP Non-Hierarchical 14	+	+	+
RLE	+	+	+

4.2.4.3.1.3. SOP Specific Conformance for SOP Classes

The Send Image AE conforms to the SOP's of the Storage Service Class at level 2 (full). No data elements are discarded or coerced by the Send Image AE.

The behavior on successful and unsuccessful transfer of images is given in the table below.

Table 38: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	
Warning	Coercion of data elements	B000	Log; Continue
	Elements discarded	B006	Log; Continue
	Data set does not match SOP class	B007	Log; Continue
Error	Processing failure	0110	Log; Continue
	Data set does not match SOP class	A900	Log; Continue
	Cannot understand	C000	Log; Continue
Refused	Data set does not match SOP class	A700	Log; Continue

Exceptions:
1. The clinical user cancels the 'Send' request. If the request is already active, the store connection will be closed and the data will not be sent. If the request is still in the waiting queue, it will be marked as CANCELLED.
2. If, after setting up the connection, no data can be send to the external DICOM node for 120 seconds, Xcelera will retry once and than it will abort the connection.
3. If an error occurs on Xcelera while setting up the connection, Xcelera will notify the external DICOM node and than abort the connection.
4. If an error occurs on the external DICOM node while setting up the connection, Xcelera will abort all actions related to that connection and report errors.
5. If no agreement between the two parties can be reached concerning communication parameters the connection will be closed and no data transfer will take place.
6. When a network error occurs during connection set up or during image transfer, Xcelera will abort all actions related to the connection.
7. If an error occurs on Xcelera during image transfer, Xcelera will notify the external DICOM node of this problem and after that close the connection.
8. If an error occurs on the external DICOM node during image transfer, the causes the connection to be aborted.

4.2.4.4. Association Acceptance Policy

The Send Image AE will never accepts any associations.

4.2.5. Query/Retrieve as SCU AE

Xcelera allowed the clinical user to query and retrieve data from other systems in the DICOM network. In communications with other nodes, Xcelera operates as a DICOM Query/Retrieve SCU and DICOM Store SCP, which are compatible with DICOM Query/Retrieve SCP and Store SCU provided by other products.

4.2.5.1.   SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 39: SOP Classes for Query/Retrieve as SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

.

4.2.5.2.   Association Policies

4.2.5.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Query/Retrieve as SCU AE is 28 Kbytes.

Table 40: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.5.2.2. Number of Associations

The number of associations for the Query/Retrieve SCU service that may be active simultaneously is 5.

Table 41: Number of Associations as an Association Initiator for Query/Retrieve as SCU AE

Maximum number of simultaneous associations	5

4.2.5.2.3. Implementation Identifying Information

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 42: DICOM Implementation Class and Version for Query/Retrieve as SCU AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.5.3.   **Association Initiation Policy**

This session describes the conditions under which the AE will initiate an association.
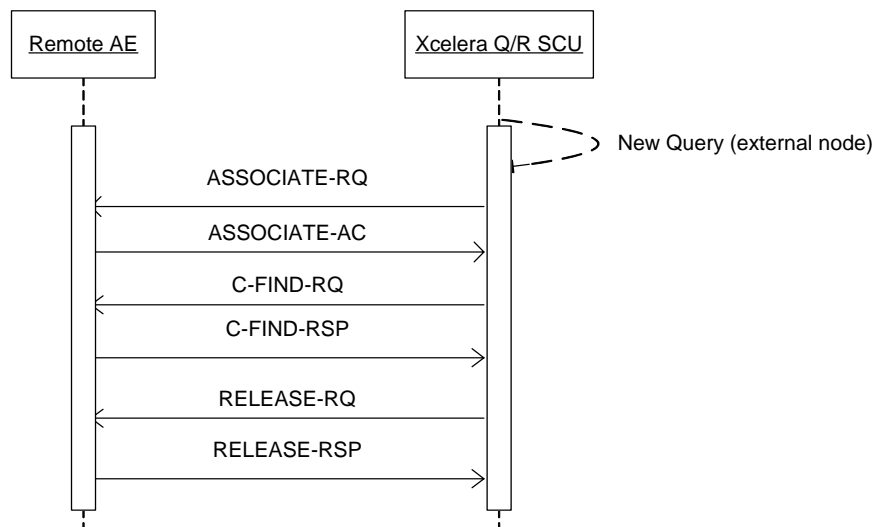
Figure 8: Flow diagram Query external DICOM node for information on DICOM images.

Normal flow of events: (see Figure 8 - Query)
1. Xcelera sets up a connection with the selected external DICOM node.
2. Once the connection has been set up and all communication parameters have been negotiated, Xcelera sends out the query information to external DICOM node.
3. In response, the external DICOM node returns (0 or more) query results in the form of a list of studies that meet the search criteria entered earlier by the clinical user. The maximum number of returned studies is 1000.
4. The connection will close by Xcelera.

Normal flow of events: (see Figure 9 Retrieve)
1. Xcelera sets up a request connection with the external DICOM node that provided the query results, and negotiates communication parameters.
2. Xcelera sends a retrieve request to the external DICOM node. The external DICOM node sets up a store connection with the Store SCP. Connection set up take place and is only accepted by the Store SCP if the Query/Retrieve SCU has an open retrieve connection with the external DICOM node.
3. The external DICOM node sends over the requested DICOM image data.
4. The connection will close by Xcelera.
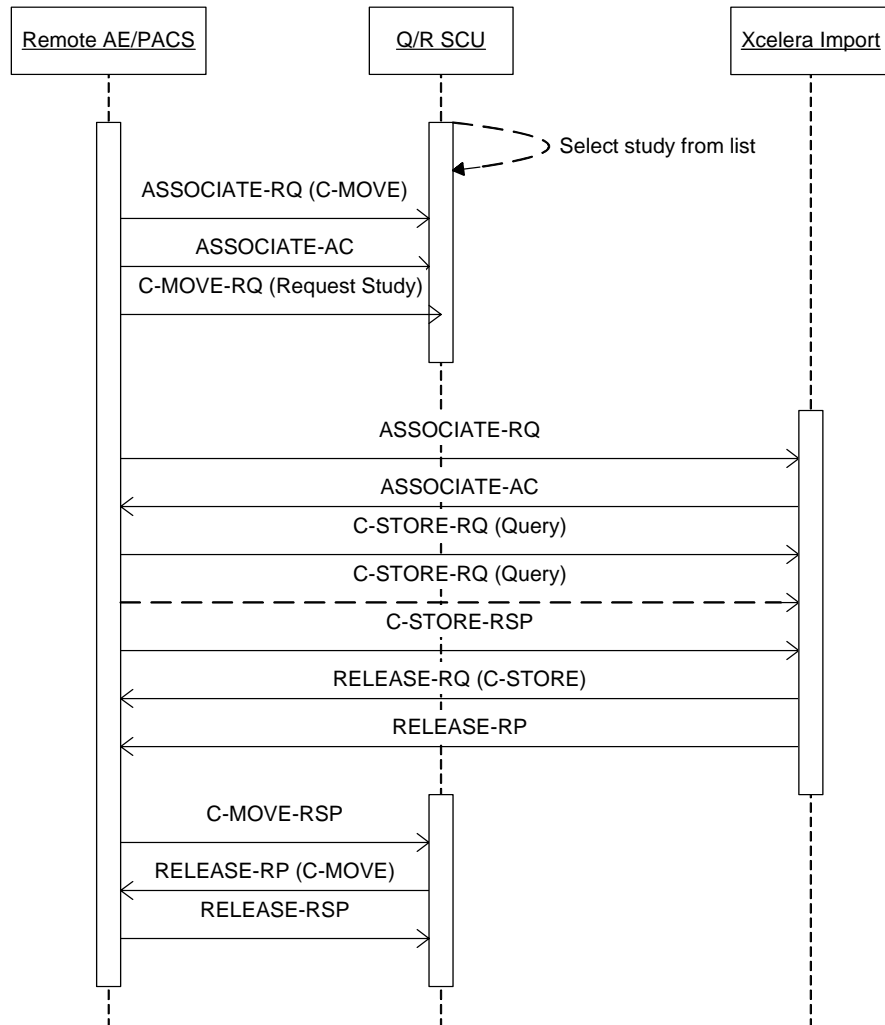
Figure 9: Flow diagram Retrieve DICOM image data from external DICOM node.

4.2.5.3.1. (Real-World) Activity – Query/Retrieve as SCU AE (C-FIND)

4.2.5.3.1.1. Description and Sequencing of Activities

The Query/Retrieve as SCU AE initiates associations to other systems that support the Study Root Query/Retrieve C-FIND service.

4.2.5.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Query/Retrieve as SCU AE for (Real-World) Activity – Query/Retrieve as SCU AE are defined in next table.

Table 43: Proposed Presentation Contexts for <(Real-World) Activity – Query/Retrieve as SCU AE (C-FIND)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	ELE EBE ILE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.5.3.1.3. SOP Specific Conformance for SOP Classes

Only Study level queries are supported.

The Query/Retrieve as SCU AE supports queries based on the combination of the following (Study level) attributes and attribute matching types (as defined in [DICOM] PS 3.4).

Table 44: Attribute Matching of the Query/Retrieve as SCU AE (C-FIND)

Key Attribute Name	Tag	Attribute Matching Type
Study Instance UID	0020,000D	Universal Matching.
Study Date	0008,0020	Universal Matching. Range Matching
Accession Number	0008,0050	Universal Matching Wild Card Matching Single Value Matching
Patient's Name	0010,0010	Universal Matching Wild Card Matching (ref. Note).
Patient ID	0010,0020	Universal Matching Wild Card Matching Single Value Matching
Modalities in Study	0008,0061	Universal Matching
Patient's Birth Date	0010,0030	Universal Matching Single Value Matching
Patient's Sex	0010,0040	Universal Matching Single Value Matching

Note The Patient's Name key attribute matching type is implicitly converted from Single Value matching to Wild Card matching by adding a Wild Card "" character at the end of its value.*

All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in next table

Table 45: DICOM Command Response Status Handling Behavior (C-MOVE)

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	
Refused	Out of resources	A700	Log; Release association.
Failed	Identifier does not match SOP class	A900	Log; Release association.
	Unable to process	C001	Log; Release association.
Cancel	Matching terminated due to cancel request	FE00	Log; Release association.
Pending	Matches are continuing – current match is supplied and any optional keys were supported in the same manner as required keys	FF00	Continue
	Matches are continuing – warning that one or more optional keys were not supported for existence and/or matching for this identifier	FF01	Continue

4.2.5.3.2. (Real-World) Activity – Query/Retrieve as SCU AE (C-MOVE)

4.2.5.3.2.1. Description and Sequencing of Activities

The Query/Retrieve as SCU AE initiates associations to other systems that support the Study Root Query/Retrieve C-MOVE service.

4.2.5.3.2.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Query/Retrieve as SCU AE for (Real-World) Activity – Query/Retrieve as SCU AE are defined in next table.

Table 46: Proposed Presentation Contexts for <(Real-World) Activity – Query/Retrieve as SCU AE (C-MOVE)

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	ELE EBE ILE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.5.3.2.3. SOP Specific Conformance for SOP Classes

Only Study level queries are supported.
The Query/Retrieve as SCU AE supports queries based on the combination of the following (Study level) attributes and attribute matching types (as defined in [DICOM] PS 3.4). All details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors are provided in the next table

Table 47: DICOM Command Response Status Handling Behavior for Retrieve from remote AE Request (C-MOVE)

Service Status	Further Meaning	Error Code	Behavior
Success	Sub-operations complete – no failures	0000	Sub-operations Complete - No Failures
Refused	Out of resources - Unable to perform sub-operations	A702	Log; Release association.
	Out of Resources - Unable to calculate number of matches	A701	Log; Release association
	Move Destination unknown	A801	Log; Release association
Failed	Identifier does not match SOP class	A900	Log; Release association.
	Unable to process	C001	Log; Release association.
Warning	Sub-operations complete – one or more failures	B000	The SCP has retrieved all requested images. Release association
Cancel	Sub-operations terminated due to cancel request	FE00	Log; Release association.
Pending	Sub-operations are continuing	FF00	Retrieval continues

Exceptions:
1. The maximum number of parallel query/retrieve is reached. The request is queued by FIFO order.
2. At any point in time, an error occurs in the network or on the external DICOM node, Xcelera will close the connection.
3. If an error occurs during image transfer, Xcelera will close the connection.
4. If an error occurs on de external DICOM node while setting up the connection, Xcelera will abort all actions related to that connection and report an error.

4.2.5.4. Association Acceptance Policy

The Query/Retrieve as SCU never accepts any associations

4.2.6. Query/Retrieve as SCP AE

Xcelera supports the DICOM Query/Retrieve SOP class as service provider (SCP). The model to be supported at minimum is:
- A Query/Retrieve SCU initiates an association for a FIND
- A Query/Retrieve SCU initiates an association for a MOVE
- The Store SCU will initiate one or more associations (STORE) to the AE indicated in the MOVE to send the data requested in the MOVE
- While the data is being sent, the MOVE association remains open until all data is sent and only then the response on the MOVE is sent.

4.2.6.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 48: SOP Classes for Query/Retrieve as SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	No	Yes
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	No	Yes
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	No	Yes
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	No	Yes

When the Query/Retrieve C-MOVE service is requested, the Query/Retrieve as SCP AE provides standard SCU conformance for the DICOM V3.0 SOP classes specified in next table.

Table 49: Supported Storage SOP Classes for Query/Retrieve as SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
Comprehensive SR	1.2.804.10008.5.1.4.1.1.88.33	Yes*	No

Note: SOP Classes are also supported, but only with the stored transfer syntax. This implies that those SOP classes are handled in such manner that what comes in will be send out.

Not mentioned SOP Classes are also supported, but only with the stored transfer syntax. This implies SOP Classes that are not mentioned are handled in such manner that what comes in will be send out.

Private SOP Classes however will not be supported.

4.2.6.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.6.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Query/Retrieve as SCP AE is 28 Kbytes.

Query/Retrieve logs all queries and requests for images, and all rejected Associations.

Table 50: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.6.2.2. Number of Associations

The number of associations for the Query/Retrieve SCP will handle can be up to 10. For the verification service at least one association can be handled simultaneously. The Query/Retrieve as SCP will only accept DICOM Associations from imaging systems with AE Titles listed in Xcelera configuration files. The storage part of the Query/Retrieve function can handle 5 simultaneous associations.

Table 51: Number of Associations as an Association Initiator for Query/Retrieve as SCP AE (C-STORE)

Maximum number of simultaneous associations	5

Table 52: Number of Associations as an Association Acceptor for Query/Retrieve as SCP AE (C-FIND)

Maximum number of simultaneous associations	5

Table 53: Number of Associations as an Association Acceptor for Query/Retrieve as SCP AE (C-ECHO)

Maximum number of simultaneous associations	1

4.2.6.2.3. Implementation Identifying Information

In the following table is documented in the Implementation Class UID and Implementation Version Name of this application entity.

Table 54: DICOM Implementation Class and Version for Query/Retrieve as SCP AE

Implementation Class UID	1.3.46.670589.16.14.1.4
Implementation Version Name	Xcelera R1.2.L4
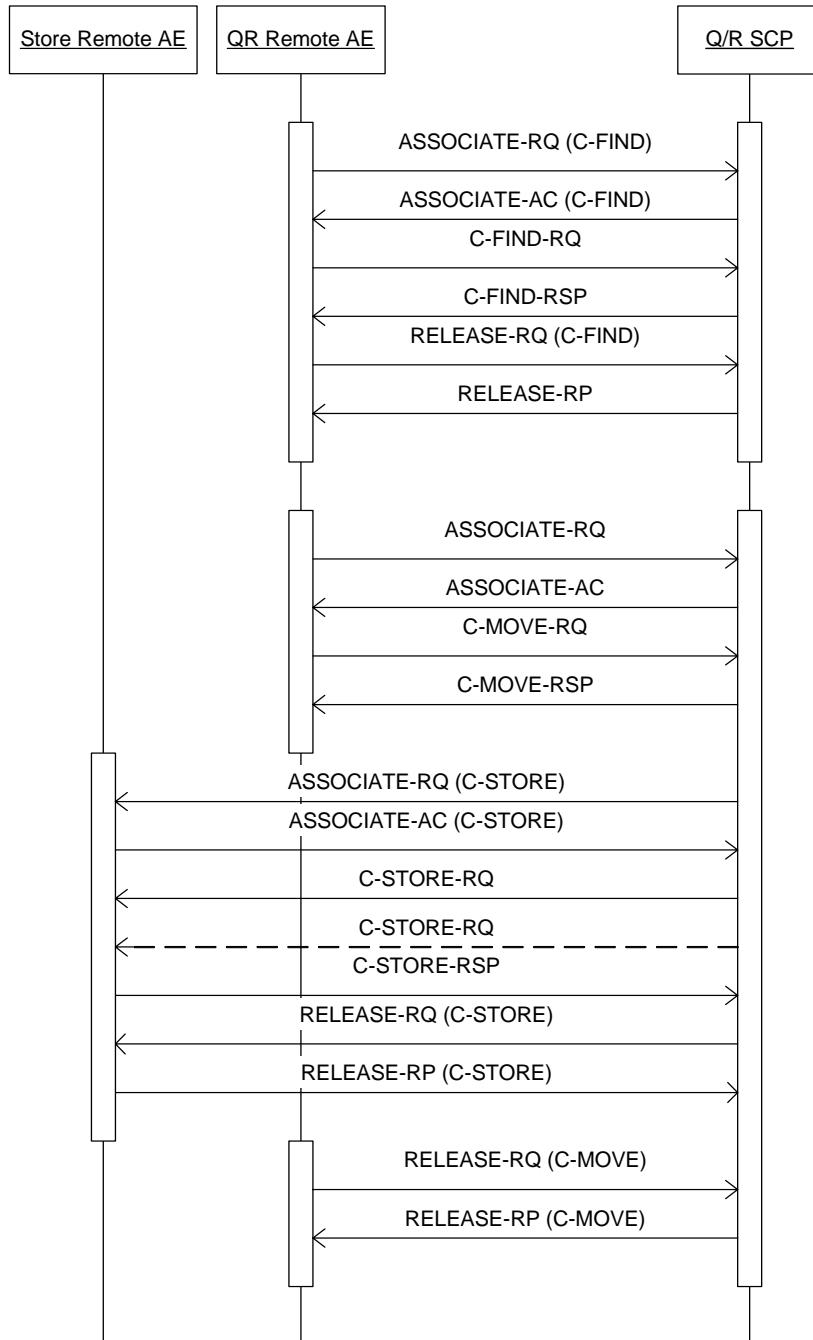
Figure 10: Sequence of RWA Query/Retrieve as SCP

Normal Flow of events:
1. Xcelera accepts the set up request of the remote node. Once the connection has been set up Xcelera receives the query request. In response Xcelera will send (0 of more) queues in the result. The connection will be closed.
2. A new connection will be set up for the retrieve request. If request was successful an association with the store remote node will be set up.
3. The request information will be send to the store remote node
4. Connection with the store remote node and the request retrieve node will be closed.

4.2.6.3.   Association Initiation Policy
This describes the conditions under which the AE will initiate an association.

4.2.6.3.1. (Real-World) Activity – C-STORE

4.2.6.3.1.1. Description and Sequencing of Activities
After the C-MOVE request the Query/Retrieve as SCP (C-STORE) will only export the requested images.

Table 55: Association Rejection Reason

Result	Source DICOM UL	Reason/ Diag	Explanation
1-reject-permanent	1-service-user	1-no-reason-given	If reason not
1-reject-permanent	1-service-user	2-application-context-name-not supported	Send when application context name not supported
1-reject-permanent	1-service-user	3-calling-AE-title not recognized	Send when calling AE title not recognized
1-reject-permanent	1-service-user	7-called-AE-title-not-recognized	Send when called AE title not recognized
1-reject-permanent	2-service-provider-(ACSE-related-function)	2-protocol-version-not supported	Send when protocol version not supported
	0- unknown	0- unknown	By Initiate abort
	2- service-provider-(ACSE-related-function)	0- unknown	By Initiate abort

4.2.6.3.1.2. Proposed Presentation Contexts
The following table illustrates the proposed presentation contexts for the image storage request.

Table 56: Proposed Presentation Contexts for (Real-World) Activity – C-STORE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1				
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

Not mentioned SOP classes are also supported, but only with the stored transfer syntax. This implies that not mentioned SOP classes are handled in such manner that what comes in will be send out.

- The DICOM Store SCU sends the same attribute values that were received
- The DICOM Store SCU supports all transfer syntaxes
- The DICOM Store SCU supports from 8-bit to 24-bit per pixel images
- The DICOM Store SCU supports gray-scale and color images, both plane-by-plane and pixel-by-pixel
- The DICOM Store SCU supports decompression, but not compression, of images

- The DICOM Store SCU supports conversion of transfer syntax (must be prepared to do a conversion from the transfer syntax in which the data is stored to the transfer syntax which is negotiated with the remote DICOM Store SOP Specific Conformance for SOP Classes

The behavior on successful and unsuccessful transfer of images is given in the table below.

Table 57: Query/Retrieve as SCP Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	No failures	0000	
Warning	Coercion of Data Elements	B000	Log; Continue.
	Elements Discarded	B006	Log; Continue.
	Data Set does not match SOP Class	B007	Log; Continue.
Error	Processor failure	0110	Log; Continue
	Invalid dataset	A900	Log; Continue.
	Can not understand	C000	Log; Continue.
Refused	No resources	A700	Log; Continue.

4.2.6.4.   Association Acceptance Policy

4.2.6.4.1.   (Real-World) Activity – C-ECHO

4.2.6.4.1.1. Description and Sequencing of Activities

The Query/Retrieve as SCP AE accepts associations from systems that wish to verify application level communication using the C-ECHO command.

4.2.6.4.1.2. Accepted Presentation Contexts

Table 58: Acceptable Presentation Contexts for (Real-World) Activity – C-ECHO

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.6.4.1.3. SOP Specific Conformance for SOP Classes

The Query/Retrieve as SCP AE provides standard conformance.

The Query/Retrieve as SCP (C-ECHO) accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Query/Retrieve as SCP AE will accept multiple proposed Presentation Contexts with the same SOP

Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts.

4.2.6.4.2. (Real-World) Activity – C-FIND

Xcelera allows the clinical user to query and retrieve data from other systems in the DICOM network. In communications with other nodes, Xcelera operates as a DICOM Query/Retrieve SCU and DICOM Store SCP, which are compatible with DICOM Query/Retrieve SCP and Store SCU provided by other products.

4.2.6.4.2.1. Description and Sequencing of Activities

Query/Retrieve as SCP AE accepts associations from systems that wish to query Xcelera database using the C-FIND command.

4.2.6.4.2.2. Accepted Presentation Contexts

The Query/Retrieve as SCP AE will accept the presentation contexts as given in the next table.

Table 59: Acceptable Presentation Contexts for (Real-World) Activity – C-FIND

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Patient/Study Only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.6.4.2.3. SOP Specific Conformance for SOP Classes

The Query/Retrieve as SCP provides standard conformance.

The Query/Retrieve as SCP (C-ECHO) accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Query/Retrieve as SCP will accept multiple proposed Presentation Contexts with the same SOP Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts.

If the C-FIND query is such that more than 1000 matches are found the Query/Retrieve SCP will return an error "out of resources" indicating there are more matches than the system can handle.

The behavior of an Application Entity is summarized as shown in next table. The standard as well as the manufacturer specific status codes and their corresponding behavior is specified.

Table 60: Query/Retrieve as SCP C-FIND Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	No final identifier is supplied
Failed	Invalid dataset	A900	Related fields (0000,0901) (0000,0902)
Pending	Current match is supplied	FF00	Matches are continuing; Current match is supplied and any Optional Keys were supported in the same manner as Required Keys. (Related fields: identifier)
	Warning	FF01	Matches are continuing; Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier (Related fields: identifier).
Refused	Out of resources	A700	Related fields (0000,0902)

If a query returns more than 1000 results, the system sends an "out of resources" messages back to the client instead or returning query results.

4.2.6.4.2.4. Overview of the applied SOP Classes

Relational queries are not supported. The Query/Retrieve as SCP AE simultaneously handles simultaneous C-FIND requests.

The Query/Retrieve as SCP AE supports hierarchical queries only
The Query/Retrieve as SCP AE supports queries for all unique and required patient, study, series and instance level key attributes, as follows:

Table 61: Patient Root Query/Retrieve Information Model

Attribute Name	Tag	VR	Type of Matching	Notes
Specific Character Set	0008,0005	CS		
SOP Instance UID	0008,0018	UI	Single Value Matching Universal Matching List of UID Matching	
Study Date	0008,0020	DA	Single Value Matching Universal Matching Range Matching	
Study Time	0008,0030	TM	Single Value Matching Universal Matching	
Accession Number	0008,0050	SH	Single Value Matching Universal Matching	
Query/Retrieve Level	0008,0052	CS		Patient, Study, Series
Modality	0008,0060	CS	Single Value Matching Universal Matching	
Referring Physicians Name	0008,0090	TM	Single Value Matching Universal Matching	Optional Attribute
Performed Physician's Name	0008,1050	PN		
Patient's Name	0010,0010	PN	Single Value Matching Universal Matching Wild Card Matching (not case sensitive)	
Patient ID	0010,0020	LO	Single Value Matching Universal Matching Wild Card Matching	
Patient's Birth Date	0010,0030	SH	Single Value Matching Universal Matching Range Matching	Optional Attribute
Patient's Sex	0010,0040	CS	Single Value Matching Universal Matching	Optional Attribute

Body Part Examined	0018,0015	CS	Single Value Matching Universal Matching	Optional Attribute
Protocol Name	0018,1030	LO	Single Value Matching Universal Matching	Optional Attribute
Study Instance UID	0020,000D	UI	Single Value Matching Universal Matching List of UID Matching	
Series Instance UID	0020,000E	UI	Single Value Matching Universal Matching List of UID Matching	
Study ID	0020,0010	SH	Single Value Matching Universal Matching Wild Card Matching	
Series Number	0020,0011	IS	Single Value Matching Universal Matching	
Instance Number	0020,0013	IS	Single Value Matching Universal Matching	

Table 62: Study Root Query/Retrieve Information Model

Attribute Name	Tag	VR	Type of Matching
Specific Character Set	0008,0005	CS	
SOP Instance UID	0008,0018	UI	Single Value Matching Universal Matching List of UID Matching
Study Date	0008,0020	DA	Single Value Matching Universal Matching Range Matching
Study Time	0008,0030	TM	Single Value Matching Universal Matching
Accession Number	0008,0050	SH	Single Value Matching Universal Matching
Query/Retrieve Level	0008,0052	CS	
Modality	0008,0060	CS	Single Value Matching Universal Matching
Referring Physicians Name	0008,0090	TM	Single Value Matching Universal Matching
Performed Physician's Name	0008,1050	PN	
Patient's Name	0010,0010	PN	Single Value Matching Universal Matching Wild Card Matching (not case sensitive)
Patient ID	0010,0020	LO	Single Value Matching Universal Matching Wild Card Matching
Patient's Birth Date	0010,0030	SH	Single Value Matching Universal Matching Range Matching
Patient's Sex	0010,0040	CS	Single Value Matching Universal Matching
Body Part Examined	0018,0015	CS	Single Value Matching Universal Matching
Protocol Name	0018,1030	LO	Single Value Matching Universal Matching
Study Instance UID	0020,000D	UI	Single Value Matching Universal Matching List of UID Matching
Series Instance UID	0020,000E	UI	Single Value Matching Universal Matching List of UID Matching

Study ID	0020,0010	SH	Single Value Matching Universal Matching Wild Card Matching
Series Number	0020,0011	IS	Single Value Matching Universal Matching
Instance Number	0020,0013	IS	Single Value Matching Universal Matching

Table 63: Patient/Study Only Query/Retrieve Information Model

Attribute Name	Tag	VR	Type of Matching
Specific Character Set	0008,0005	CS	
SOP Instance UID	0008,0018	UI	Single Value Matching Universal Matching List of UID Matching
Study Date	0008,0020	DA	Single Value Matching Universal Matching Range Matching
Study Time	0008,0030	TM	Single Value Matching Universal Matching
Accession Number	0008,0050	SH	Single Value Matching Universal Matching
Query/Retrieve Level	0008,0052	CS	
Modality	0008,0060	CS	Single Value Matching Universal Matching
Referring Physicians Name	0008,0090	TM	Single Value Matching Universal Matching
Performed Physician's Name	0008,1050	PN	
Patient's Name	0010,0010	PN	Single Value Matching Universal Matching Wild Card Matching (not case sensitive)
Patient ID	0010,0020	LO	Single Value Matching Universal Matching Wild Card Matching
Patient's Birth Date	0010,0030	SH	Single Value Matching Universal Matching Range Matching
Patient's Sex	0010,0040	CS	Single Value Matching Universal Matching
Body Part Examined	0018,0015	CS	Single Value Matching Universal Matching
Protocol Name	0018,1030	LO	Single Value Matching Universal Matching
Study Instance UID	0020,000D	UI	Single Value Matching Universal Matching List of UID Matching
Series Instance UID	0020,000E	UI	Single Value Matching Universal Matching List of UID Matching
Study ID	0020,0010	SH	Single Value Matching Universal Matching Wild Card Matching
Series Number	0020,0011	IS	Single Value Matching Universal Matching
Instance Number	0020,0013	IS	Single Value Matching Universal Matching

4.2.6.4.3. (Real-World) Activity – C-MOVE

4.2.6.4.3.1. Description and Sequencing of Activities

The Query/Retrieve as SCP AE accepts associations from systems that wish to retrieve images from Xcelera database using the C-MOVE service.
The Query/Retrieve as SCP AE accepts all contexts in the intersection of the proposed and acceptable Presentation Context. This means that the Query/Retrieve as SCP AE will accept multiple proposed Presentation Contexts with the same SOP Class but different Transfer Syntaxes, so there will be no checks for duplicate Presentation Contexts

4.2.6.4.3.2. Accepted Presentation Contexts

The Query/Retrieve as SCP AE will accept the presentation contexts as given in the next table.

Table 64: Acceptable Presentation Contexts for (Real-World) Activity – C-MOVE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.6.4.3.3. SOP Specific Conformance for SOP Classes

The Query/Retrieve as SCP AE provides standard conformance.

The Query/Retrieve as SCP AE supports all Query/Retrieve SOP classes. A C-STORE association is built after the C-MOVE request. The Query/Retrieve as SCP AE does not send intermediate C-MOVE responses with status pending.

The behavior of successful and unsuccessful Query/Retrieve as SCP AE is given in the table below.

Table 65: Query/Retrieve as SCP C-MOVE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Sub-operations complete	0000	No final identifier is supplied Related fields (0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations complete	B000	One or more failures Related fields (0000,1020) (0000,1022) (0000,1023)
Failed	Invalid dataset	A900	Related fields (0000,0901) (0000,0902)
	Unable to process	C001	Related fields (0000,0901) (0000,0902).

4.2.7. Print AE

4.2.7.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 66: SOP Classes for Print AE

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	Yes	No
Print Job	1.2.840.10008.5.1.1.14	Yes	No
Basic Annotation Box	1.2.840.10008.5.1.1.15	Yes	No

4.2.7.2. Association Policies

The number of associations for the Print Management service that may be active simultaneously is 1.

4.2.7.2.1. General

The DICOM standard application context is specified.

Table 67: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.7.2.2. Number of Associations

Table 68: Number of Associations as an Association Initiator for Print AE

Maximum number of simultaneous associations	1

4.2.7.2.3. Implementation Identifying Information

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 69: DICOM Implementation Class and Version for Print AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.7.3. Association Initiation Policy

After the activation of the Print function the Print AE will print the SOP instances as provided by the RWA to a hardcopy medium.

4.2.7.3.1. (Real-World) Activity – Print AE

4.2.7.3.1.1. Description and Sequencing of Activities
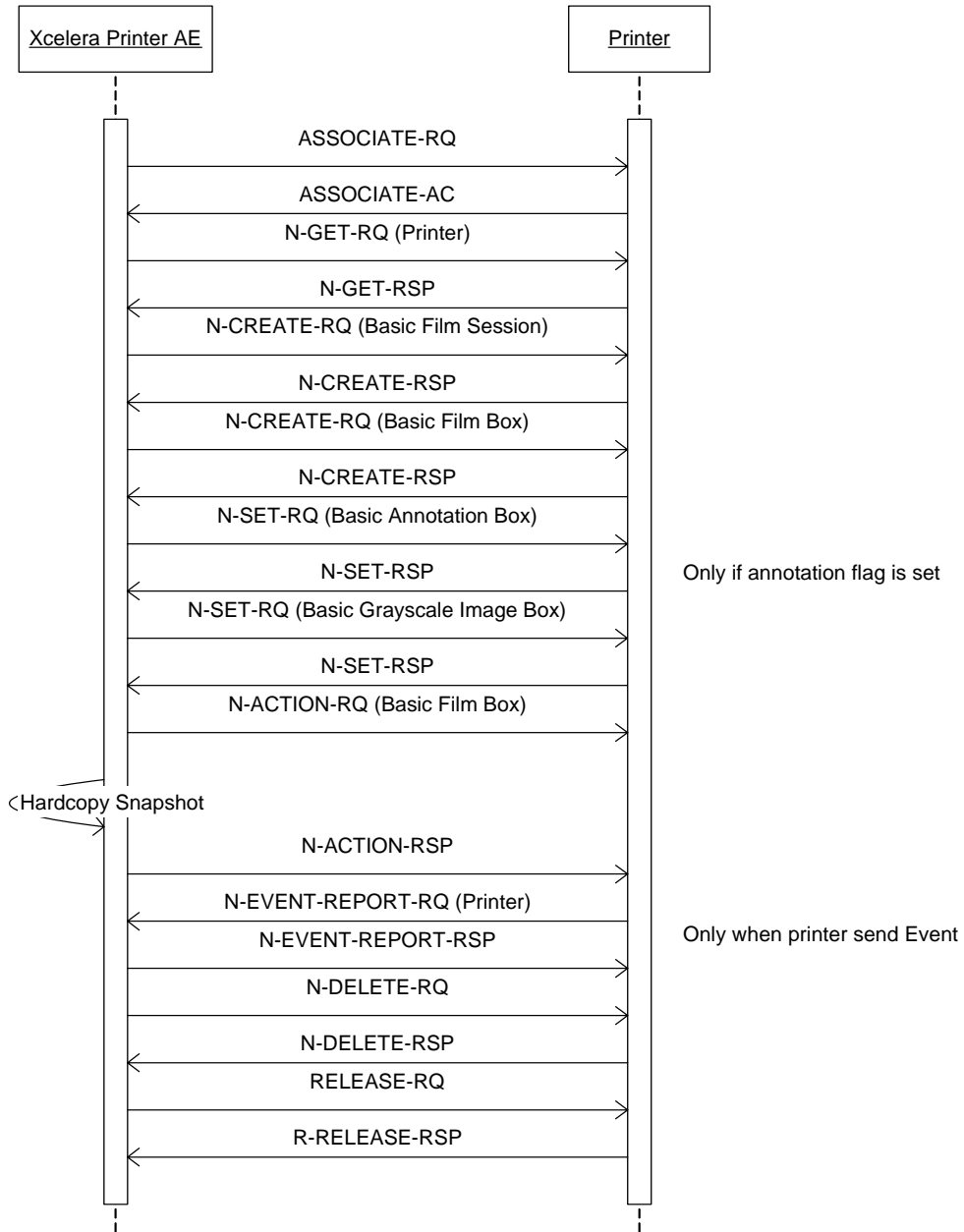
Figure 11: Sequence of RWA Print

Normal Flow of Event:
After the print job is selected a connection with the printer will be made.
The Xcelera send the job with or without annotation to the printer.
The printer print his job and send a successful response back to Xcelera.
Xcelera reports the success on the screen.

4.2.7.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Print AE for (Real-World) Activity – Print AE are defined in next table.

Table 70: Proposed Presentation Contexts for (Real-World) Activity – Print AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

.

4.2.7.3.1.3. Common SOP Specific Conformance for all Print SOP Classes

Exceptions:
The print job cannot been completed by the printer:
- Printer errors are handling in the same way as given in the next table.
- DICOM transfer errors to the printer are treated as normal DICOM transfer errors and are recorded appropriately.
- The printer can use the Basic Annotation Box SOP Class when the annotation flag is set. A control on the SOP Classes during setup of the Association is used to check of the printer known this SOP Class.

Table 71: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Operation successfull
Warning/Failure		<>0000	Log; Continue
Error		<>0000	Log; Abort

4.2.7.3.1.4. SOP Specific Conformance for Basic Film Session SOP Classes

The Print AE conforms to the Basic Film Session SOP Class. No data elements are discarded or coerced by the Print AE.

The following DIMSE service elements is supported:

- N-CREATE
- N-DELETE

The following table lists the supported attributes for the N-CREATE DIMSE.

Table 72: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	2000,0010	IS	Enumerated values: 1	ALWAYS	USER
Print Priority	2000,0020	CS	Enumerated values: MED	ALWAYS	USER

4.2.7.3.1.5. SOP Specific Conformance for Basic Film Box SOP Classes

The Print AE conforms to the Basic Film Box SOP Class. No data elements are discarded or coerced by the Print AE.

The following DIMSE service elements is supported:

- N-CREATE
- N-ACTION

The following table lists the supported attributes for the N-CREATE DIMSE.

Table 73: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	2010,0010	ST	1: STANDARD 2: 1,1; 1,2; 2,1; 2,2; 2,3; 3,2; 3,3; 3,4; 3,5; 4,4; 4,5; 4,6	ALWAYS	AUTO
Annotation Display Format ID	2010,0030	CS	ANNOTATION	ALWAYS	AUTO
Film Orientation	2010,0040	CS	PORTRAIT; LANDSCAPE	ALWAYS	AUTO
Referenced Film Session Sequence	2010,0500	SQ		ALWAYS	AUTO
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO

The behavior on successful and unsuccessful transfer is given in the table below.

Table 74: N-CREATE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Operation successfull
Error	Failure	<>0000	Log; Abort
Warning	Warning	<>0000	Log; Continue

The following table lists the supported attributes for the N-ACTION DIMSE.

Table 75: Basic Film Box SOP Class - N-ACTION RQ - Sop Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	0008,0005	CS		ALWAYS	AUTO

SOP Class UID	0008,0016	UI		ALWAYS	AUTO
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO

4.2.7.3.1.6. SOP Specific Conformance for Basic Grayscale Image Box SOP Class

The Print AE conforms to the Basic Grayscale Image Box SOP Class. No data elements are discarded or coerced by the Print AE.

The following DIMSE service elements is supported:

- N-SET

The following table lists the supported attributes for the N-SET DIMSE.

Table 76: Basic Grayscale Image Box SOP Class - N-SET-RQ - Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	2020,0010	US		ALWAYS	AUTO
Requested Decimate/Crop Behavior	2020,0040	CS	DECIMATE	ALWAYS	AUTO
Preformatted Grayscale Image Sequence	2020,0110	SQ		ALWAYS	AUTO
> Samples per Pixel	0028,0002	US		ALWAYS	AUTO
> Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO
> Planar Configuration	0028,0006	US	Additional attribute	ANAP	Config
> Rows	0028,0010	US		ALWAYS	AUTO
> Columns	0028,0011	US		ALWAYS	AUTO
> Pixel Aspect Ratio	0028,0034	IS	1\1	ALWAYS	AUTO
> Bits Allocated	0028,0100	US		ALWAYS	AUTO
> Bits Stored	0028,0101	US		ALWAYS	AUTO
> High Bit	0028,0102	US		ALWAYS	AUTO
> Pixel Representation	0028,0103	US		ALWAYS	AUTO
> Window Center	0028,1050	DS	Additional attribute	ANAP	Config
> Window Width	0028,1051	DS	Additional attribute	ANAP	Config
> Pixel Data	7FE0,0010	OW		ALWAYS	AUTO

4.2.7.3.1.7. SOP Specific Conformance for Printer SOP Class

The Print AE conforms to the Printer SOP Class. No data elements are discarded or coerced by the Print AE

The following DIMSE service elements is supported:

- N-EVENT-REPORT
- N-GET

The following table lists the supported attributes for the N-GET DIMSE.

Table 77: Printer SOP Class - N-GET-RQ - Printer Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	0008,0070	LO		ALWAYS	AUTO

Manufacturer Model Name	0008,1090	LO		ALWAYS	AUTO
Device Serial Number	0018,1000	LO		ALWAYS	AUTO
Software Versions	0018,1020	LO		ALWAYS	AUTO
Date of Last Calibration	0018,1200	DA		ALWAYS	AUTO
Time of Last Calibration	0018,1201	TM		ALWAYS	AUTO
Printer Status	2110,0010	CS		ALWAYS	AUTO
Printer Status Info	2110,0020	CS		ALWAYS	AUTO
Printer Name	2110,0030	LO		ALWAYS	AUTO

4.2.7.3.1.8. SOP Specific Conformance for Basic Annotation Box SOP Class

The Print AE conforms to the Basic Annotation Box SOP Class. No data elements are discarded or coerced by the Print AE.

The following DIMSE service elements is supported:

- N-SET

The following table lists the supported attributes for the N-SET DIMSE

Table 78: Basic Annotation Box SOP Class - N-SET - Printer Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Annotation Position	2030,0010	US	1	ALWAYS	AUTO
Text String	2030,0020	LO	Contains Patient's Name (0010,0010)	ALWAYS	AUTO

4.2.7.4. Association Acceptance Policy

The Print AE never accepts any associations.

4.2.8. Archiving AE

4.2.8.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 79: SOP Classes for Archive AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes (Note 1)	No
3D Subpage Store – Private SOP	1.3.46.670589.2.5.1.1	Yes (Note 1)	No

Note 1: Only for compatibility with NEO Ultrasound device
Note 2: Only for compatibility with Xcelera systems

4.2.8.2. Association Policies

4.2.8.2.1. General

The maximum length PDU negotiation is included in all association establishment requests. The default maximum length PDU for an association initiated by the Imaging Import AE is 28 Kbytes.

Table 80: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.8.2.2. Number of Associations

The number of associations for the storage SCP service that may be active simultaneously is 1. For the verification service only one association can be handled at a time.

Table 81: Number of Associations as an Association Initiator for Archive AE

Maximum number of simultaneous associations	1

Table 82: Number of Associations as an Association Initiator for Archive AE (Store and Storage Commitment)

Maximum number of simultaneous associations	Unlimited

Table 83: Number of Associations as an Association Acceptor for Archive AE

Maximum number of simultaneous associations	Unlimited

4.2.8.2.3. Implementation Identifying Information

In the following table is documented the Implementation Class UID and Implementation Version Name of this application entity.

Table 84: DICOM Implementation Class and Version for Archive AE

Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

4.2.8.3. Association Initiation Policy

4.2.8.3.1. (Real-World) Activity – Archiving AE (C-STORE - Storage Commitment)

4.2.8.3.1.1. Description and Sequencing of Activities
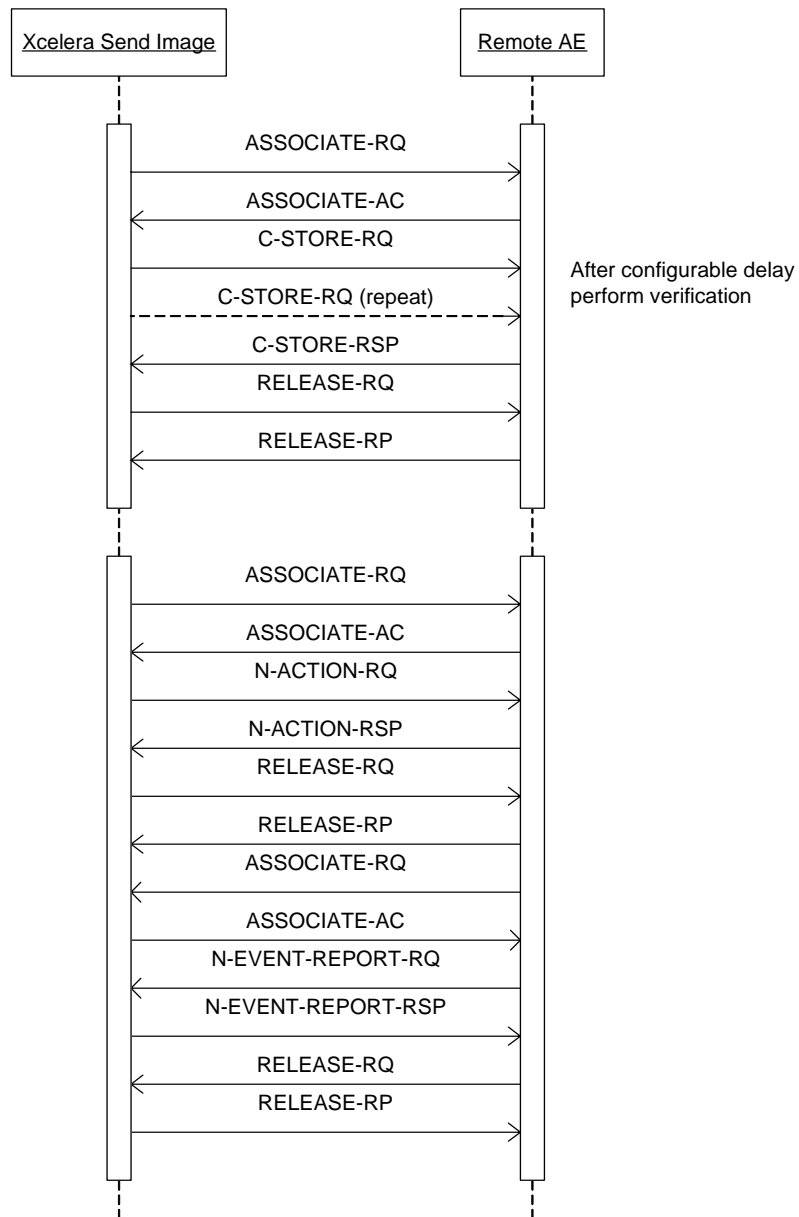
Figure 12: Sequence of RWA Archiving AE (C-STORE - Storage Commitment SCU)

Normal Flow of events:
1. If a long-term archive is configured, the study will be copied to that archive in a way that is compatible with the archive medium or remote PACS server. This will happen after a configurable delay has passed (e.g. it is not possible to archive deltas of incoming data on CD or DVD).
2. The copied data is marked as archived in the database, along with the archive location data.
3. Xcelera PACS system checks if study has been stored on the archive, in a way depedent on the type of archive:
4. In case of a DICOM archive storage commit request is send to the external archive. Once a successful response is received, the study is marked as 'verified' in the database.

4.2.8.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association.

Table 85: Proposed Presentation Contexts for (Real-World) Activity – Archive AE (Storage Commitment)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 86: Proposed Presentation Contexts for (Real-World) Activity – Archive AE (C-STORE)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1				
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	ELE ILE EBE RLE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6				
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ELE ILE EBE JPEG Lossy Baseline JPEG Lossless FOP *	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.70	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
3D Subpage Store – Private SOP	1.3.46.670589.2.5.1.1	ELE ILE EBE	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

Table 87: Auto Store Transfer syntax conversion

Source Syntax	Destination Syntax		
	ILE	**ELE**	**EBE**
ILE	-	+	+
ELE	+	-	+
EBE	+	+	-
JPEG Losless FOP Non-Hierarchical 14	+	+	+
RLE	+	+	+

4.2.8.3.1.3. Storage Commitment Notifications (N-EVENT-REPORT)

The Archive AE (Storage Commitment) provides standard conformance to the Storage Commitment Push Model SOP Class.
The following N-EVENT-REPORT attributes are sent.

Table 88: N-EVENT-REPORT Attributes

Event Type Name	Event Type ID	Attribute	Tag	Note
Storage	1	Transaction UID	(0008,1195)	-

Event Type Name	Event Type ID	Attribute	Tag	Note
Commitment Request Successful		Referenced SOP Sequence	(0008,1199)	-
		>Referenced SOP Class UID	(0008,1150)	-
		>Referenced SOP Instance UID	(0008,1155)	-
Storage Commitment Request Complete - Failures Exist	2	Transaction UID	(0008,1195)	-
		Failed SOP Sequence	(0008,1198)	-
		>Referenced SOP Class UID	(0008,1150)	-
		>Referenced SOP Instance UID	(0008,1155)	-
		>Failure Reason	(0008,1197)	-

The reasons for returning specific status codes in N-EVENT-REPORT response are summarized in next table.

Table 89: Storage Commitment N-EVENT-REPORT Response Status Reasons

Service Status	Further Meaning	Error Code	Behavior
Succes		0000	

Exceptions:
1. If the data cannot be archived because of problems with the archive medium then the system will retry this operation up to 100 times.
2. If the archive is connected using DICOM protocols (DICOM Archive), and the data cannot be archived because of DICOM connection failures Xcelera will not remove the get archived from the repository by storage space and wait with the clean up until they have been archived after intervention:
3. After setting up the connection, no data can be sent to the external node for 60 seconds, Xcelera aborts the connection.
4. An error occurs on Xcelera while setting up the connection, Xcelera aborts the connection. For data that cannot be recompressed to lossy format, a longer TTL may be applied.
5. An error occurs on the target node while setting up the connection. If the retries are unsuccessful, the system will mark the data for later.
6. An error occurs on Xcelera during image conversion or image transfer, Xcelera will abort the auto forward. A final error will be reported.
7. An error occurs on the target node during image transfer, results the connection to be aborted Xcelera will report this error.
8. An error or warning concerning data transfer is received from the target node during data transfer. If it is related to the data being send Xcelera tries to correct the cause of the error
9. If the archive is connected using DICOM protocols (DICOM Archive), thumbnail images will not be archived. These will be regenerated when retrieving data from the archive to short-term-storage.

4.2.8.3.2. (Real-World) Activity – Archiving AE (C-MOVE)

4.2.8.3.2.1. Description and Sequencing of Activities
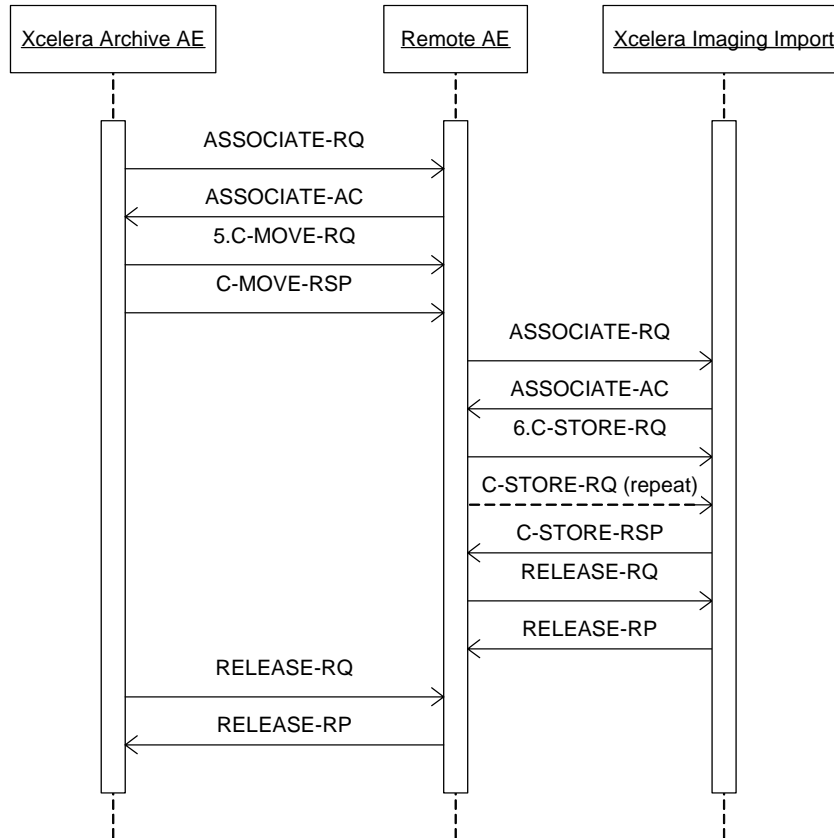
Figure 13: Sequence of RWA Archiving AE (Query/Retrieve SCU)

Normal flow of events:
Steps in fetch from DICOM Archive:
1. Sends a DICOM C-MOVE (using StudyUID from the database as identifier) request to the DICOM archive for each study to be fetched.
2. In response to the C-MOVE performs a C-STORE to Xcelera Image Import AE.

4.2.8.3.2.2. Proposed Presentation Contexts

Each time an association is initiated, the association initiator proposes a number of presentation contexts to be used on that association. In this subsection, the presentation contexts proposed by Archive AE for (Real-World) Activity – Archive AE are defined in next table.

Table 90: Proposed Presentation Contexts for <(Real-World) Activity – Archive AE (C-MOVE)

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiati on**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	ELE EBE ILE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.8.3.2.3. SOP Specific Conformance for SOP Classes

Only Study level queries are supported.

The Archive AE supports queries based on the combination of the following (Study level) attributes and attribute matching types (as defined in [DICOM] PS 3.4).

Table 91: Attribute Matching of the Archive AE (C-MOVE)

Key Attribute Name	Tag	Attribute Matching Type
Study Instance UID	0020,000D	Universal Matching.

Exceptions:
1. If, after setting up the connection and sending the query, no data is received from the external DICOM node before a (user configurable) time out has passed, the PACS server aborts the connection.
2. If an error occurs on the external DICOM node while setting up the connection, the PACS server will abort all actions related to the connection and report errors.
3. If no agreement between the two parties can be reached concerning communication parameters the connection will be closed and no query communications will take place.
4. If an error occurs on the PACS server during query communications, the PACS server will abort the connection.
5. The maximum number of parallel query and/or retrieve connections (at same time at least 5, licensing limited) is reached. In this case, the request is queued in a waiting queue. Queued requests will be handled in the normal manner in FIFO order once other requests are completed.

4.2.8.4. Association Acceptance Policy

The Archive AE is using the Image Import AE for SCP functionality.

4.3. Network Interfaces

4.3.1. Physical Network Interface

TCP/IP is the only protocol stack supported:
- The TCP/IP stack as supported by the underlying Operating System.
- The API is the WinSock 2 interface as supported by the underlying Operating System.

Supported physical medium include:
- IEEE 802.3-1995 100BASE-TX (Fast Ethernet)
- IEEE 802.3-1995 10BASE-TX
- IEEE 802.3   1000BASE-X (Fiber Optic Gigabit Ethernet)

4.3.2. Additional Protocols

Xcelera operates according to DICOM protocols, in the application layer of standardized communications networks. From this perspective the system supports a number of protocol stacks and physical network media. The system supports DICOM protocols on top of the TCP/IP version 4.
A PPP Connection over dial-up line in the same network is possible.

4.4. Configuration

4.4.1. AE Title/Presentation Address Mapping

In Xcelera the local Network and Media AE titles as well as the IP Address and the TCP listen port associated with these AE are configurable.
The different AE's in Xcelera can be configured to use the same AE title.

Xcelera only accepts associations of AE Titles that are configured in Xcelera.

Due to variety of network configurations that exist worldwide, no performance guaranties can be given with respect to the time it takes to complete the execution of a job.

4.4.1.1. Local AE Titles

The local AE title mapping and configuration is specified as following:

Table 92: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Imaging Import AE	INTURISPRO_SCP	104
Send Images AE	SEND_SCU	
Auto Export AE		
Storage Commitment AE	STCO_SCP	4000
Query/Retrieve as SCU AE	QR_SCU	
Query/Retrieve as SCP AE	QR_SCP	7000
Print AE	VIEWER_PRINT_SCU	104
Archive AE		

4.4.1.2.   Remote AE Title/Presentation Address Mapping

Configuration of remote host names and port numbers is specified here.

Table 93: AE Title Remote Configuration Table

Application Entity Configuration	Description	Default TCP/IP Port
Imaging Import AE	For import client options can be defined: AETitle Hostname IP-address Storage-commit-port Merge delay	
Auto Export AE	For export can be defined: SCP AETitle SCU AETitle Server IP Address Port number Server list Server description Server path Username password	
Send Images AE	AETitle Hostname IP-address Listen port Logical name	
Storage Commitment AE	AETitle Listen port Hostname Archive time Response time-out	
Query/Retrieve as SCU AE	For Query/Retrieve SCU external option: Q/R SCP AETitle Store SCU AETitle Hostname, IP-Address Listen port Logical name	
Query/Retrieve as SCP AE	For Query/Retrieve SCP external option: AETitle Hostname IP-address	
Print AE	AETitle IP-address Hostname	
Archive AE	For Archiving AETitle Hostname IP-address Listen port	

4.4.2. Parameters

The specification of important operational parameters and, if configurable, their default value and range is specified here. The parameters that apply to all Application Entities should be specified in a "General Parameters" section while those specific to particular Application Entities should be specified in separate sections specific to each AE. The following table is used.

Table 94: Configuration Parameters table

Parameter	Configurable YES/NO	Default Value
General Parameter		
Max PDU Receive Size	No	28 Kbytes
Max PDU Send Size	No	28 Kbytes
Time-out for completion of a TCP/IP connect request (Low-level timeout).	No	60 seconds
Time-out awaiting a Response to a DIMSE Request (Low-level timeout).	No	60 seconds
Time-out for waiting for data between TCP/IP-packets (Low-level timeout).	No	60 seconds
Storage Parameters		
Storage SCU time-out waiting for a response to a C-STORE RQ	No	60 seconds
Time out for reception	No	120 seconds
Maximum number of simultaneously initiated Associations by the Storage AE	No	10
Supported Transfer Syntaxes (seperately configurable for each remote AE	No	
Query/Retrieve Parameters (SCU and SCP)		
Maximum PDU size	No	28 Kbytes
Maximum Number of simultaneous Associations (SCU)	No	1 (C-ECHO), 5 (C-STORE), 5 (C-FIND) 1 (Printer) 1 (Archiving)
Q/R SCU DICOM Timeout (SCU)	Yes {300-1500}	450 seconds
Q/R SCU Retrieve Timeout (SCU)	Yes {1..7}	1 days
Q/R best case query response time (SCP)	No	2 seconds
Q/R worst case query response time (SCP)	No	10 seconds
Storage Commitment Parameters		
Maximum time to wait for cases to be archived	Yes	Maximum 8 hours
Maximum number of times for retrying sending a response – with one hours interval	Yes	Maximum 72 times
Print Parameters		
Maximum number of simultaneous Associations	No	1
Maximum numbers of connected printers	No	5

Additional configuration parameters such as hardware options for e.g. a printer is specified as well.

5. MEDIA INTERCHANGE

5.1. Implementation Model

The Media AE provides standard conformance for the DICOM Media Storage and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11).

5.1.1. Application Data Flow Diagram

As part of the implementation model, an application data flow diagram is included. This diagram represents all of the Application Entities present in an implementation and graphically depicts the relationship of the AE's use of DICOM to Real-World Activities.
Figure 14 is a template for such a data flow diagram. Accompanying the application data flow diagram is a discussion of the application data flow represented.

In this illustration, an occurrence of local Real-World Activity A or B will cause the local Application Entity 1 to initiate either creation of a File-Set on a medium (FSC) for the purpose of interchange with a remote Real-World Activity X or to access a File-Set on a medium for reading (FSR). The remote Real-World Activity X accesses the medium physically transferred from Real-World Activity A or B.

An occurrence of Real-World Activity C will cause the local Application Entity 2 to update a File-set (FSU) on a mounted medium.
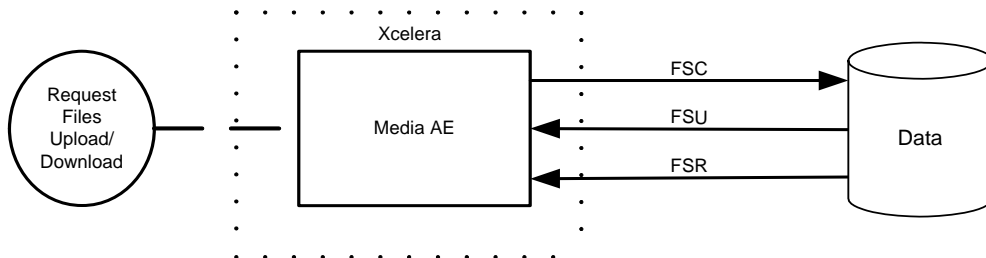
Figure 14: Application Data Flow Diagram for Media CD/DVD

Note: It's not possible to handle DICOM Media which contains non-supported SOP classes.

5.1.2. Functional Definitions of AE's

The next part of the Conformance Statement contains the functional definition for each local Application Entity. This describes in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM service classes, but also to lower level DICOM services, such as the Media File System and mapping to particular media formats.

5.1.2.1.   **Functional Definition of Xcelera Media AE**

The Media AE in an Xcelera supports the following Reading functions for CD-R, DVD and MOD.

- Read the DICOMDIR File from the medium (representing the directory of the DICOM File(s) as recorded on the medium). This information may be displayed as an ordered list of icon images and, if present, with pertinent identifying information (patient name, etc.).

- Read the selected image from the medium and display it on the monitor of the View Station. This information is displayed as an ordered list of frames of the selected image or as a dynamic review of the selected image.

The Media AE in an Xcelera supports the following Writing functions for CD-R and DVD:

- Initialize the medium.
- Write a DICOM File-set onto the medium.
- Create a DICOMDIR File.
- Extend the DICOM File-set and update the DICOMDIR File accordingly. (DICOM Media Storage Service Class).

5.1.3. Sequencing of Media Real World Activities

Table 95: Conformance Supported Application Profiles

Application Profile Identifier	Presentation Context Table			
	Abstract Syntax		Transfer Syntax	
	Name	UID	Name List	UID List
STD-GEN-CD STD-GEN-DVD-JPEG	Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	ELE	1.2.840.10008.1.2.1
	CT Image Storage	1.2.840.10008.5.1.4.1.1.2		
	Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20		
	X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1		
	X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2		
	Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1		
	MR Image Storage	1.2.840.10008.5.1.4.1.1.4		
	Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1		
	Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7		
STD-XABC-CD STD-XABC-DVD	X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless FOP	1.2.840.10008.1.2.4.70
STD-XA1K-CD STD-XA1K-DVD	X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless FOP	1.2.840.10008.1.2.4.70
	Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE	1.2.840.10008.1.2.1
STD-US-ID-SF-CD STD-US-ID-SF-DVD STD-US-ID-SF-MOD*	Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	ELE JPEG Lossy Baseline RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5
STD-US-ID-MF-CD STD-US-ID-SF-DVD STD-US-ID-MF-MOD*	Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE JPEG Lossy Baseline RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5
STD-US-SC-MF-CD STD-US-ID-SF-DVD STD-US-SC-MF-MOD*	Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	ELE JPEG Lossy Baseline RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.5
ALL	Media Storage Directory Storage	1.2.840.10008.1.3.10	ELE	1.2.840.10008.1.2.1

.

5.1.4. File Meta Information for Implementation Class and Version

The Application Entity title is registered in the DICOM File Meta Information header and is supported by the CD/DVD-writer (CD/DVD write option) acting as FSC/FSU.

Table 96: DICOM Implementation Class and Version for Media AE

File Meta Information Version	00, 01
Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

5.2.   AE Specifications

5.2.1. Media AE - Specification

If applicable, this section contains a description of sequencing of Media Real-World Activities that the AE's require.

Depending on the study size, the viewer can write one or more complete studies to one or more CD/DVD's. Furthermore one viewer can review and upload:

- Multi-patient CD/DVD's;
- Multi-study CD/DVD's;
- Multi-CD/DVD studies.

The supported Application Profiles, supported Roles and the Service Class Options, all defined in DICOM terminology, are listed in next table.

Table 97: Supported Application Profiles

Application Profile	Identifier	Real World Activity	Role	Service Class Option
Basic cardiac X-Ray Angiographic Studies on CD/DVD media	STD-XABC-CD STD-XABC-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
1024 X-Ray Angiographic Studies on CD/DVD Media	STD-XA1K-CD STD-XA1K-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
General Studies on CD/DVD Media (General Purpose CD/DVD)	STD-GEN-CD STD-GEN-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
Ultrasound Studies on CD/DVD, FLOP, or MOD Media	STD-US-ID-MF-CDR STD-US-ID-MF-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-ID-SF-CDR STD-US-ID-SF-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-SC-MF-CDR STD-US-SC-MF-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange

		Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-SC-SF-CDR STD-US-SC-SF-DVD	Write image(s) to CD/DVD	FSC	Interchange
		Read image(s) from CD/DVD	FSR	Interchange
		Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-ID-MF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-ID-SF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-SC-MF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-SC-SF-MOD*	Read image(s) from MOD	FSR	Interchange

* The supported MOD (FSR) Application Profiles include all Application Profiles where MOD* is MOD12, MOD23, MOD128, MOD230, MOD540, or MOD650.

5.2.1.1.   File Meta Information for the Media AE

The Application Entity title is registered in the DICOM File Meta Information header and is supported by the CD/DVD-writer (CD/DVD write option) acting as FSC/FSU.

Table 98: DICOM Implementation Class UID, Version Name and Media AE

Application Entity Title	"VIEWER_STORE_SCU"
Implementation Class UID	1.3.46.670589.16.14.1.3.4
Implementation Version Name	Xcelera R1.2.L4

5.2.1.2.   Real-World Activities

5.2.1.2.1.   Real World Activities DICOM Recording

For the Real World Activities DICOM Recording the Media AE will write the SOP instances as provided by the RWA to the record able DICOM medium and a corresponding DICOMDIR is created.

5.2.1.2.1.1. Media Storage Application Profile

See table below for an overview of the support of the Application Profiles.

Table 99: Supported Application Profiles with Role FSC

Application Profile	Identifier	Real World Activity	Role	SC Option
Basic cardiac X-Ray Angiographic Studies on CD/DVD media	STD-XABC-CD STD-XABC-DVD	Write image(s) to CD/DVD	FSC	Interchange
1024 X-Ray Angiographic Studies on CD/DVD Media	STD-XA1K-CD STD-XA1K-DVD	Write image(s) to CD/DVD	FSC	Interchange
General Studies on CD/DVD Media (General Purpose CD/DVD)	STD-GEN-CD STD-GEN-DVD	Write image(s) to CD/DVD	FSC	Interchange
Ultrasound Studies on CD/DVD or MOD Media	STD-US-ID-MF-CDR STD-US-ID-MF-DVD	Write image(s) to CD/DVD	FSC	Interchange
	STD-US-ID-SF-CDR STD-US-ID-SF-DVD	Write image(s) to CD/DVD	FSC	Interchange
	STD-US-SC-MF-CDR STD-US-SC-MF-DVD	Write image(s) to CD/DVD	FSC	Interchange
	STD-US-SC-SF-CDR STD-US-SC-SF-DVD	Write image(s) to CD/DVD	FSC	Interchange

The following table presents an overview of the defined Photometric Interpretation and Transfer Syntax pairs for the Ultrasound Application Profiles (STD-US-xx-SF/MF…).

Table 100: Defined Photometric Interpretation and Transfer Syntax Pairs

Photometric Interpretation Value	Transfer Syntax	
	Name	UID
MONOCHROME2	ELE RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5
RGB	ELE RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5
PALETTE COLOR	ELE RLE	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5
YBR_FULL	RLE	1.2.840.10008.1.2.5
YBR_FULL_422	ELE JPEG Lossy Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50
YBR_PARTIAL_422	ELE JPEG Lossy Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50

5.2.1.2.1.2. Options

In the DICOMDIR file a Basic Directory IOD is present, containing PATIENT, STUDY, SERIES and IMAGE directory record types.

The DICOM standard specifies certain attributes of the DICOMDIR as mandatory. However, these attributes may not be mandatory for the related SOP class IOD. For those attributes the following default values apply.

Table 101: Default Values used in DICOMDIR

Attribute Name	Tag	VR	Notes
Study Date	0008,0020	DA	"17770101"
Study Time	0008,0030	TM	"00000"
Modality	0008,0060	CS	"OT"
Patient ID	0010,0020	LO	"UNKNOWN"
Study ID	0020,0010	SH	"UNKNOWN"
Series Number	0020,0011	IS	-1
Instance Number	0020,0013	IS	-1

Note that the STD-US, and STD-GEN, application profiles allow additional data elements at each directory level (ref. [DICOM] PS 3.11 Annex). In that context the optional attributes only apply to the STD-XABC and STD-XA1K application profiles.

The following tables describe the optional directory keys of the Media AE.

Table 102: Optional Keys

Attribute name	Tag	VR	Notes
Patient Keys			
Patient's Birth Date	0010,0030	DA	Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD, STD-XABC-DVD and STD-XA1K-DVD (VT=2).
Patient's Sex	0010,0040	CS	Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD, STD-XABC-DVD and STD-XA1K-DVD (VT=2).
Study Keys			
Referring Physician's Name	0008,0090	PN	-
Named of Physician Reading Study	0008,1060	PN	-
Series Keys			
Series Date	0008,0021	DA	-
Series Time	0008,0031	TM	-
Institution Name	0008,0080	LO	Implicit additional DICOMDIR key for STD-US, and STD-GEN, Application Profiles. Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD, STD-XABC-DVD and STD-XA1K-DVD (VT=2).
Institution Address	0008,0081	ST	Implicit additional DICOMDIR key for STD-US, and STD-GEN, Application Profiles. Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD, STD-XABC-DVD and STD-XA1K-DVD (VT=2).
Series Description	0008,103E	LO	-
Performing Physician's Name	0008,1050	PN	Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD, STD-XABC-DVD and STD-XA1K-DVD (VT=2).
Body Part Examined	0018,0015	CS	-
Protocol Name	0018,1030	LO	-
Image Keys			
Image Type	0008,0008	CS	Explicit additional DICOMDIR key for Application Profiles: STD-XABC-CD, STD-XA1K-CD and STD-GEN-CD (VT=1). STD-XABC-DVD, STD-XA1K-DVD and STD-GEN-DVD (VT=1).
Content Date	0008,0023	DA	-
Content Time	0008,0033	TM	-

5.2.1.2.2. Real World Activities DICOM Reading

For Real World Activities DICOM Reading, the Media AE will act as an FSR using the Interchange option when reading the directory of the medium and when reading the requested images.

5.2.1.2.2.1. Media Storage Application Profile

See table below for an overview of the support of the Application Profiles.

Table 103: Supported Application Profiles with Role FSR

Application Profile	Identifier	Real World Activity	Role	SC Option
Basic cardiac X-Ray Angiographic Studies on CD/DVD media	STD-XABC-CD STD-XABC-DVD	Read image(s) from CD/DVD	FSR	Interchange
1024 X-Ray Angiographic Studies on CD/DVD Media	STD-XA1K-CD STD-XA1K-DVD	Read image(s) from CD/DVD	FSR	Interchange
General Studies on CD/DVD Media (General Purpose CD/DVD)	STD-GEN-CD STD-GEN-DVD	Read image(s) from CD/DVD	FSR	Interchange
Ultrasound Studies on CD/DVD, FLOP, or MOD Media	STD-US-ID-MF-CDR STD-US-ID-MF-DVD	Read image(s) from CD/DVD	FSR	Interchange
	STD-US-ID-SF-CDR STD-US-ID-SF-DVD	Read image(s) from CD/DVD	FSR	Interchange
	STD-US-SC-MF-CDR STD-US-SC-MF-DVD	Read image(s) from CD/DVD	FSR	Interchange
	STD-US-SC-SF-CDR STD-US-SC-SF-DVD	Read image(s) from CD/DVD	FSR	Interchange
	STD-US-ID-MF-FLOP	Read image(s) from Flop	FSR	Interchange
	STD-US-ID-SF-FLOP	Read image(s) from Flop	FSR	Interchange
	STD-US-SC-MF-FLOP	Read image(s) from Flop	FSR	Interchange
	STD-US-SC-SF-FLOP	Read image(s) from Flop	FSR	Interchange
	STD-US-ID-MF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-ID-SF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-SC-MF-MOD*	Read image(s) from MOD	FSR	Interchange
	STD-US-SC-SF-MOD*	Read image(s) from MOD	FSR	Interchange

* The supported MOD (FSR) Application Profiles include all Application Profiles where MOD* is MOD12, MOD23, MOD128, MOD230, MOD540, or MOD650.

5.2.1.2.3. Real World Activities DICOM Update

For Real World Activities DICOM Reading, the Media AE will act as an FSU using the Interchange option when reading the directory of the medium and when reading the requested images.

5.2.1.2.3.1. Media Storage Application Profile

See table below for an overview of the support of the Application Profiles.

Table 104: Supported Application Profiles with Role FSU

Application Profile	Identifier	Real World Activity	Role	SC Option
Basic cardiac X-Ray Angiographic Studies on CD/DVD media	STD-XABC-CD STD-XABC-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
1024 X-Ray Angiographic Studies on CD/DVD Media	STD-XA1K-CD STD-XA1K-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
General Studies on CD/DVD Media (General Purpose CD/DVD)	STD-GEN-CD STD-GEN-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
Ultrasound Studies on CD-R, FLOP, or MOD Media	STD-US-ID-MF-CDR STD-US-ID-MF-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-ID-SF-CDR STD-US-ID-SF-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-SC-MF-CDR STD-US-SC-MF-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange
	STD-US-SC-SF-CDR STD-US-SC-SF-DVD	Read/Write image(s) from/to CD/DVD	FSU	Interchange

Exceptions:
1. Less than 25MB of free space is available on the CD/DVD: in this case the Xcelera system will notify the user through an error message and will request another CD/DVD to be inserted.
   Nothing will be recorded on the CD/DVD with limited free space.
2. Not enough disk space is available to create the CD/DVD image. In this case, the writing process is aborted and the user is notified about the problem through an error message.
3. Studies and additional files do not fit on a single CD/DVD. The Xcelera system will request an additional CD/DVD after filling the first one.
   The writing operation shall only be aborted
4. No CD/DVD inserted into CD/DVD recorder, or 'closed'/corrupt CD/DVD in CD/DVD-recorder. The system will report these errors.
5. One or more of the studies selected for writing to CD/DVD consist (partly) of lossy compressed data. The system will notify the user of this, providing the option to cancel the operation. If the clinical user decides to create the CD/DVD anyway, a disclaimer text file will be added to the CD/DVD, indicating that the CD/DVD contains lossy compressed data.
6. JPEG or RLE images of selected studies do not contain Basic Offset Table. The system will add such a table.
7. Images of selected studies contain a format (DICOM SOP class) that is not supported by the viewing functions of the Inturis Suite viewer workspot. These images will be written to CD/DVD as a DICOM media file but only if no transfer syntax conversion is required, i.e. if they are stored on the system in ELE or JPEG non-hierarchical 14 format. If such a conversion is required, the clinical user will be notified, and no CD/DVD is written.
8. The use case Merge Patients on CD/DVD was performed and there is not enough free space on the CD/DVD to add the new studies and additional files. In this case the Xcelera system will immediately request an empty CD/DVD, without adding any studies to the existing CD/DVD.

5.3.   Augmented and Private Application Profiles

The Media AE supports no augmented Application Profiles.
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5.3.1. Private Application Profiles

The Media AE supports no private Application Profiles.
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5.4.   Media Configuration

N.A.

6. SUPPORT OF CHARACTER SETS

Any support for character sets beyond the default character repertoire in Network services shall be described here.

Table 105: Supported DICOM Character Sets of Xcelera

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Single-byte Character Sets without Code Extensions					
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859 (Western Europe supplementary set 1)

7. SECURITY

Support of DICOM security profiles are not used.

8. ANNEXES

8.1. IOD Contents

8.1.1. Created SOP Instances

This section specifies each IOD created (including private IOD's). It should specify the attribute name, tag, VR, and value. The value should specify the range and source (e.g. user input, Modality Worklist, automatically generated, etc.). For content items in templates, the range and source of the concept name and concept values should be specified. Whether the value is always present or not is specified.

Recommended abbreviations to be used for the tables are:

VNAP	Value Not Always Present
	(attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ANAP	Attribute Not Always Present, but present under Condition.
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

Recommended abbreviations to be used for the source of the data values in the tables are:

USER	the attribute value source is from User input
AUTO	the attribute value is generated automatically
CONFIG	the attribute value source is a configurable parameter

8.1.1.1.   SC Image IOD Module Table

Table 106: IOD of created SC Image IOD module

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
Study	General Study		ALWAYS
	Patient Study		ALWAYS
Series	General Series		ALWAYS
Equipment	General Equipment		ANAP
	SC Image Equipment		ALWAYS
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	SC Image		ALWAYS
	SOP Common		ALWAYS

8.1.1.2.   Common modules used for ALL SC Image Storage SOP Classes

Table 107: C-STORE-RQ - Patient Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	0010,0010	PN		ALWAYS	AUTO

Patient ID	0010,0020	LO		ALWAYS	AUTO
Patient's Birth Date	0010,0030	DA		ALWAYS	AUTO
Patient's Sex	0010,0040	CS		ALWAYS	AUTO
Patient's Birth Time	0010,0032	TM		ALWAYS	AUTO

Table 108: C-STORE-RQ - General Study Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Date	0008,0020	DA		ALWAYS	AUTO
Study Time	0008,0030	TM		ALWAYS	AUTO
Accession Number	0008,0050	SH		VNAP	AUTO
Referring Physician's Name	0008,0090	PN		VNAP	AUTO
Study Instance UID	0020,000D	UI		ALWAYS	AUTO
Study ID	0020,0010	SH		VNAP	AUTO

Table 109: C-STORE-RQ - General Series Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	0008,0060	CS		ALWAYS	AUTO
Series Date	0008,0021	DT		ALWAYS	AUTO
Series Time	0008,0031	TM		ALWAYS	AUTO
Series Instance UID	0020,000E	UI		ALWAYS	AUTO
Series Number	0020,0011	IS		VNAP	AUTO

Table 110: C-STORE-RQ - General Equipment Module (O)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	0008,0070	LO		ALWAYS	AUTO
Institution Name	0008,0080	LO		ALWAYS	AUTO
Station Name	0008, 1010	SH		ALWAYS	AUTO
Institutional Department Name	0008,1040	LO		ALWAYS	AUTO
Manufacturer's Model Name	0008,1090	LO		ALWAYS	AUTO
Software Version(s)	0018,1020	LO		ALWAYS	AUTO

Table 111: C-STORE-RQ – SC Equipment Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	0008,0060	CS		ALWAYS	AUTO
Conversion Type	0008,.0064	CS		ALWAYS	AUTO
Secondary Capture Device ID	0018,1010	LO		ALWAYS	AUTO
Secondary Capture Device Manufacturer	0018,1016	LO		ALWAYS	AUTO
Secondary Capture Device Manufacturer's Model Name	0018,1018	LO		ALWAYS	AUTO
Secondary Capture Device Software Version(s)	0018,1019`	LO		ALWAYS	AUTO

Table 112: C-STORE-RQ - General Image Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	0008,0008	CS	DERIVED, PRIMARY	ALWAYS	AUTO
Content Date	0008,0023	DA		ALWAYS	AUTO
Content Time	0008,0033	TM		ALWAYS	AUTO
Instance Number	0020,0013	IS		VNAP	AUTO
Patient Orientation	0020,0020	CS		VNAP	AUTO
Lossy Image Compression	0028,2110	CS		ALWAYS	AUTO
Lossy Image Compression Ratio	0028,2112	DS		ALWAYS	AUTO

Table 113: C-STORE-RQ - Image Pixel Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Planar Configuration	0028,0006	US	0	ALWAYS	AUTO
Rows	0028,0010	US	480	ALWAYS	AUTO
Columns	0028,0011	US	640	ALWAYS	AUTO
Bits Allocated	0028,0100	US	8	ALWAYS	AUTO
Bits Stored	0028,0101	US	8	ALWAYS	AUTO
High Bit	0028,0102	US	7	ALWAYS	AUTO
Pixel Representation	0028,0103	US	0	ALWAYS	AUTO
Pixel Data	7FE0,0010	OW		ALWAYS	AUTO

Table 114: C-STORE-RQ – SC Image Module (M)

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

Table 115: C-STORE-RQ - SOP Common Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	0008,0005	CS		ANAP	AUTO
SOP Class UID	0008,0016	UI		ALWAYS	AUTO
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO

8.1.1.3. US Image IOD Module Table

Table 116: IOD of created US Image IOD modules

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
Study	General Study		ALWAYS
	Patient Study		ANAP
Series	General Series		ALWAYS
Equipment	General Equipment		
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	Contrast/Bolus		ANAP
	Palette Color Lookup Table		ANAP
	US Image		ALWAYS
	Overlay Plane		ANAP
	SOP Common		ALWAYS
Curve	Curve Identification		ALWAYS
	Curve		ALWAYS
	Sop Common		ALWAYS

8.1.1.4. Ultrasound Image Storage SOP Class

Table 117: C-STORE-RQ - Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	0010,0010	PN		ANAP	AUTO
Patient ID	0010,0020	LO		ANAP	AUTO
Patient's Birth Date	0010,0030	DA		ANAP	AUTO
Patient's Sex	0010,0040	CS		ANAP	AUTO

Table 118: C-STORE-RQ – Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	0010,1010	AS		ANAP	AUTO

Table 119: C-STORE-RQ - General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Date	0008,0020	DA		ANAP	AUTO
Study Time	0008,0030	TM		ANAP	AUTO
Accession Number	0008,0050	SH		ANAP	AUTO
Referring Physician's Name	0008,0090	PN		ANAP	AUTO
Study Instance UID	0020,000D	UI		ALWAYS	AUTO
Study ID	0020,0010	SH		ANAP	AUTO

Table 120: C-STORE-RQ - General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source

Manufacturer	0008,0070	LO		ANAP	AUTO
Institution Name	0008,0080	LO		ANAP	AUTO

Table 121: C-STORE-RQ – Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	0010,1010	AS		ANAP	AUTO

Table 122: C-STORE-RQ - General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	0008,0060	CS		ALWAYS	AUTO
Protocol Name	0018,1030	LO		ANAP	AUTO
Series Instance UID	0020,000E	UI		ALWAYS	AUTO
Series Number	0020,0011	IS		ANAP	AUTO
Laterality	0020,0060	CS		VNAP	AUTO

Table 123: C-STORE-RQ - General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	0008,0023	DA		ANAP	AUTO
Content Time	0008,0033	TM		ANAP	AUTO
Derivation Description	0008,2111	ST		ANAP	AUTO
Instance Number	0020,0013	IS		ANAP	AUTO
Patient Orientation	0020,0020	CS		ANAP	AUTO
Image Comments	0020,4000	LT		ANAP	AUTO

Table 124: C-STORE-RQ - Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Rows	0028,0010	US		ALWAYS	AUTO
Columns	0028,0011	US		ALWAYS	AUTO
Pixel Aspect Ratio	0028,0034	IS		ALWAYS	AUTO
Pixel Data	7FE0,0010	OW		ALWAYS	AUTO

Table 125: C-STORE-RQ – VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	0028,1050	DS		ANAP	AUTO
Window Width	0028,1051	DS		VNAP	AUTO
VOI LUT Sequence	0028,3010	SQ		ANAP	AUTO

Table 126: C-STORE-RQ - SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	0008,0005	CS		ALWAYS	AUTO
SOP Class UID	0008,0016	UI		ALWAYS	AUTO

SOP Instance UID	0008,0018	UI		ALWAYS	AUTO
Instance Creator UID	0008,0014	UI		ANAP	AUTO

Table 127: C-STORE-RQ - Contrast/bolus Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contrast/Bolus Agent	0018,0010	LO		ANAP	AUTO

Table 128: C-STORE-RQ - US Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	0008,0008	CS		ANAP	AUTO
Heart Rate	0018,1088	IS		ANAP	AUTO
Samples per Pixel	0028,0002	US		ALWAYS	AUTO
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO
Planar Configuration	0028,0006	US		ALWAYS	AUTO
Frame Increment Pointer	0028,0009	AT		ALWAYS	AUTO
Ultrasound Color Data Present	0028,0014	US		ANAP	AUTO
Bits Allocated	0028,0100	US		ALWAYS	AUTO
Bits Stored	0028,0101	US		ALWAYS	AUTO
High Bit	0028,0102	US		ALWAYS	AUTO
Pixel Representation	0028,0103	US		ALWAYS	AUTO
Lossy Image Compression	0028,2110	CS		ALWAYS	AUTO

Table 129: C-STORE-RQ - Overlay Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Rows	6000,0010	US		ALWAYS	AUTO
Overlay Columns	6000,0011	US		ALWAYS	AUTO
Overlay Type	6000,0040	CS		ALWAYS	AUTO
Overlay Origin	6000,0050	SS		ALWAYS	AUTO
Overlay Bits Allocated	6000,0100	US		ALWAYS	AUTO
Overlay Bit Position	6000,0102	US		ALWAYS	AUTO
Overlay Data	6000,3000	OW		ALWAYS	AUTO

Table 130: C-STORE-RQ - Curve Identification Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Curve Number	0020,0024	IS		ANAP	AUTO

Table 131: C-STORE-RQ - Curve Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Curve Dimensions	5000,0005	US		ALWAYS	AUTO
Number of Points	5000,0010	US		ALWAYS	AUTO
Type of Data	5000,0020	CS		ALWAYS	AUTO
Data Value Representation	5000,0103	US		ALWAYS	AUTO

Curve Data Descriptor	5000,0110	US		ALWAYS	AUTO
Coordinate Start Value	5000,0112	US		ALWAYS	AUTO
Coordinate Step Value	5000,0114	US		ALWAYS	AUTO
Curve Data	5000,3000	OW		ALWAYS	AUTO

Table 132: C-STORE-RQ – Palette Color Lookup Table Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Red Palette Color Lookup Table Desrciptor	0028,1101	US/ SS		ANAP	AUTO
Green Palette Color Lookup Table Descriptor	0028,1102	US/ SS		ANAP	AUTO
Blue Palette Color Lookup Table Descriptor	0028,1103	US/ SS		ANAP	AUTO
Red Palette Color Lookup Table Data	0028,1201	OW		ANAP	AUTO
Green Palette Color Lookup Table Data	0028,1202	OW		ANAP	AUTO
Blue Palette Color Lookup Table Data	0028,1203	OW		ANAP	AUTO
Segmented Red Palette Color Lookup Table Data	0028,1221	OW		ANAP	AUTO
Segmented Green Palette Color Lookup Table Data	0028,1222	OW		ANAP	AUTO
Segmented Blue Palette Color Lookup Table Data	0028,1223	OW		ANAP	AUTO

8.1.1.5. US Multi-Frame Image IOD Module Table

Table 133: IOD of created US Multi-frame Image IOD modules

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
Study	General Study		ALWAYS
	Patient Study		ANAP
Series	General Series		ALWAYS
Equipment	General Equipment		ALWAYS
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	Contrast/Bolus		ANAP
	Cine		ALWAYS
	Multi-frame US Image		ALWAYS
	US Image		ALWAYS
	SOP Common		ALWAYS
Curve	Curve Identification		ALWAYS
	Curve		ALWAYS
	SOP Common		ALWAYS

8.1.1.6.　　Ultrasound Multi-frame Image Storage SOP Class

The Ultrasound Multi-frame Image contains the next Modules:

Table 134: C-STORE-RQ - Patient Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	0010,0010	PN		ALWAYS	AUTO
Patient ID	0010,0020	LO		VNAP	AUTO
Patient's Birth Date	0010,0030	DA		VNAP	AUTO
Patient's Sex	0010,0040	CS		VNAP	AUTO

Table 135: C-STORE-RQ – Patient Study Module (O)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	0010,1010	AS		ALWAYS	AUTO

Table 136: C-STORE-RQ - General Study Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Date	0008,0020	DA		ALWAYS	AUTO
Study Time	0008,0030	TM		ALWAYS	AUTO
Accession Number	0008,0050	SH		VNAP	AUTO
Referring Physician's Name	0008,0090	PN		VNAP	AUTO
Study Instance UID	0020,000D	UI		ALWAYS	AUTO
Study ID	0020,0010	SH		ALWAYS	AUTO

Table 137: C-STORE-RQ - General Equipment Module (M)

Attribute Name	Tag	VR	Value	Presence	Source

					of Value	
Manufacturer	0008,0070	LO			ALWAYS	AUTO
Institution Name	0008,0080	LO			VNAP	AUTO

Table 138: C-STORE-RQ - General Series Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	0008,0060	CS	US	ALWAYS	AUTO
Protocol Name	0018,1030	LO		VNAP	AUTO
Series Instance UID	0020,000E	UI		ALWAYS	AUTO
Series Number	0020,0011	IS		ALWAYS	AUTO
Laterality	0020,0060	CS		MAYBE	AUTO

Table 139: C-STORE-RQ - General Image Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	0008,0023	DA		ALWAYS	AUTO
Content Time	0008,0033	TM		ALWAYS	AUTO
Derivation Description	0008,2111	ST	ORIGINAL	ALWAYS	AUTO
Instance Number	0020,0013	IS		VNAP	AUTO
Patient Orientation	0020,0020	CS		VNAP	AUTO
Image Comments	0020,4000	LT		ANAP	AUTO

Table 140: C-STORE-RQ - Image Pixel Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Rows	0028,0010	US		ALWAYS	AUTO
Columns	0028,0011	US		ALWAYS	AUTO
Pixel Aspect Ratio	0028,0034	IS		ALWAYS	AUTO
Pixel Data	7FE0,0010	OW		ALWAYS	AUTO

Table 141: C-STORE-RQ – VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	0028,1050	DS		ANAP	AUTO
Window Width	0028,1051	DS		VNAP	AUTO
VOI LUT Sequence	0028,3010	SQ		ANAP	AUTO

Table 142: C-STORE-RQ - SOP Common Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	0008,0005	CS		ANAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Creator UID	0008,0014	UI		ALWAYS	AUTO
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.3.1	ALWAYS	AUTO
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO

Table 143: C-STORE-RQ - Contrast/bolus Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contrast/Bolus Agent	0018,0010	LO		ANAP	AUTO

Table 144: C-STORE-RQ - Curve Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Curve Dimensions	5000,0005	US		ALWAYS	AUTO
Number of Points	5000,0010	US		ALWAYS	AUTO
Type of Data	5000,0020	CS		ALWAYS	AUTO
Data Value Representation	5000,0103	US		ALWAYS	AUTO
Curve Data Descriptor	5000,0110	US		ALWAYS	AUTO
Coordinate Start Value	5000,0112	US		ALWAYS	AUTO
Coordinate Step Value	5000,0114	US		ALWAYS	AUTO
Curve Data	5000,3000	OW		ALWAYS	AUTO

Table 145: C-STORE-RQ - Curve Identification Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Curve Number	0020,0024	IS		ANAP	AUTO

Table 146: C-STORE-RQ - US Image Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	0008,0008	CS	ORGINAL, PRIMARY	ALWAYS	AUTO
Heart Rate	0018,1088	IS		ANAP	AUTO
Samples per Pixel	0028,0002	US		ALWAYS	AUTO
Photometric Interpretation	0028,0004	CS	MONOCHROME1, MONOCHROME2, PALETTE COLOR	ALWAYS	AUTO
Frame Increment Pointer	0028,0009	AT	00181063	ALWAYS	AUTO
Ultrasound Color Data Present	0028,0014	US		ANAP	AUTO
Bits Allocated	0028,0100	US		ALWAYS	AUTO
Bits Stored	0028,0101	US		ALWAYS	AUTO
High Bit	0028,0102	US		ALWAYS	AUTO
Pixel Representation	0028,0103	US		ALWAYS	AUTO
Lossy Image Compression	0028,2110	CS		ALWAYS	AUTO
Stage Name	0028,2120	SH		ANAP	AUTO
Number of Stages	0008,2124	IS		ANAP	AUTO
View Name	0028,2127	SH		ANAP	AUTO
View Number	0028,2128	IS		ANAP	AUTO
Number of Views in Stage	0008,212A	IS		ANAP	AUTO

Table 147: C-STORE-RQ – Cine Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Recommended Display Frame Rate	0008,2144	IS		VNAP	AUTO
Cine Rate	0018,0040	IS		ALWAYS	AUTO
Frame Time	0018,1063	DS		ALWAYS	AUTO

Table 148: C-STORE-RQ – Multi-Frame Module (M)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	0028,0008	IS		ALWAYS	AUTO

Table 149: C-STORE-RQ – Palette Color Lookup Module (C)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Red Palette Color Lookup Table Descriptor	0028,1101	US		ALWAYS	AUTO
Green Palette Color Lookup Table Descriptor	0028,1102	US		ALWAYS	AUTO
Blue Palette Color Lookup Table Descriptor	0028,1103	US		ALWAYS	AUTO
Red Palette Color Lookup Table Data	0028,1201	OW		ALWAYS	AUTO
Green Palette Color Lookup Table Data	0028,1202	OW		ALWAYS	AUTO
Blue Palette Color Lookup Table Data	0028,1203	OW		ALWAYS	AUTO
Palette Color Lookup Table UID	0028,1199	UI	1.2.840.113543.6.6.1.1.1.0.0	ALWAYS	AUTO

Table 150: C-STORE-RQ – US Region Calibration Module (C)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Sequence of Ultrasound Regions	0018,6011	SQ		ALWAYS	AUTO
> Region Spatial Format	0018,6012	US		ALWAYS	AUTO
> Region Data Type	0018,6014	US		ALWAYS	AUTO
> Region Flags	0018,6016	UL		ALWAYS	AUTO
> Region Location Min X0	0018,6018	UL		ALWAYS	AUTO
> Region Location Min Y0	0018,601A	UL		ALWAYS	AUTO
> Region Location Max X1	0018,601C	UL		ALWAYS	AUTO
> Region Location Max Y1	0018,601E	UL		ALWAYS	AUTO
> Reference Pixel X0	0018,6020	SL		ALWAYS	AUTO
> Reference Pixel Y0	0018,6022	SL		ALWAYS	AUTO
> Physical Units X Direction	0018,6024	US		ALWAYS	AUTO
> Physical Units Y Direction	0018,6026	US		ALWAYS	AUTO
> Reference Pixel Physical Value X	0018,6028	FD		ALWAYS	AUTO
> Reference Pixel Physical Value Y	0018,602A	FD		ALWAYS	AUTO
> Physical Delta X	0018,602C	FD		ALWAYS	AUTO
> Physical Delta Y	0018,602E	FD		ALWAYS	AUTO

8.1.2. Usage of Attributes from Received IOD's

For ultrasound images the following section gives an overview of the image formats that are supported.

Table 151: US HIGH BIT Supported

Photometric Interpretation	High Bit Value	Storing	Viewing
Monochrome2	7	Yes	Yes
RGB	7	Yes	Yes
YBR_FULL	7	Yes	Yes
YBR_FULL_422	7	Yes	Yes
YBR_PARTIAL_422	7	Yes	Yes
PALETTE COLOR	7 (8 bit palette)	Yes	Yes
PALETTE COLOR	15 (16 bit palette)	Yes	Yes

Table 152: US PLANAR CONFIGURATION Supported

Photometric Interpretation	Planar Configuration Value	Storing	Viewing
RGB	0000H (color-by-pixel)	Yes	Yes
RGB	0001H (color-by-plane)	Yes	Yes
YBR_FULL	0001H (color-by-plane)	Yes	Yes
YBR_FULL_422	0000H (color-by-pixel)	Yes	Yes
YBR_PARTIAL_422	0000H (color-by-pixel)	Yes	Yes

Table 153: US BITS ALLOCATED Supported

Photometric Interpretation	Bits Allocated Value	Storing	Viewing
MONOCHROME2	0008H	Yes	Yes
RGB	0008H	Yes	Yes
YBR_FULL	0008H	Yes	Yes
YBR_FULL_422	0008H	Yes	Yes
YBR_PARTIAL_422	0008H	Yes	Yes
PALETTE COLOR	0008H (8 bits palette)	Yes	Yes
PALETTE COLOR	0010H(16 bits palette)	Yes	Yes

Table 154: US BITS SAMPLES PER PIXEL Supported

Photometric Interpretation	Samples Per Pixel Value	Storing	Viewing
MONOCHROME2	1	Yes	Yes
RGB	3	Yes	Yes
YBR_FULL	3	Yes	Yes
YBR_FULL_422	3	Yes	Yes
YBR_PARTIAL_422	3	Yes	Yes
PALETTE COLOR	1	Yes	Yes

For the SC Image Storage, MR Image Storage and XA Image Storage all types of images can be stored and viewed.

8.1.3. Coerced/Modified fields

Xcelera can be used to modify the following attributes:

Table 155: Modifies attributes inside Xcelera

Attribute Name	Tag	VR	Notes
Study Date	0008,0020	DA	
Study Time	0008,0030	TM	
Accession Number	0008,0050	SH	
Referring Physicians Name	0008,0090	PN	
Patient's Name	0010,0010	PN	
Patient ID	0010,0020	LO	
Patient's Birth Date	0010,0030	DA	
Patient's Sex	0010,0040	CS	
Study Instance UID	0020,000D	UI	
Study ID	0020,0010	SH	

During export the values of these attributes will overrule the initially stored attribute values.

When an attribute with a Value Representation Time or DateTime is exported, the time fraction is not supported.

8.2. Data Dictionary of Private Attributes

No private attributes are defined.

8.3. Coded Terminology and Templates

The value for Code Meaning will be displayed for all code sequences. No Local Lexicon is provided to look up alternative code meanings.

8.4. Grayscale Image consistency

Xcelera is compatible with the PIE Medical QA software, if there is generated on 8, 10, 12-bit grayscale images and in 512x512 or 1024x1024 image sizes.

8.5. Standard Extended/Specialized/Private SOPs

Not mentioned SOP classes are also supported, but only with the stored transfer syntax. This implies that not mentioned SOP classes are handled in such manner that what comes in will be send out. Private SOP classes however will not be supported, because the application will not be able to determine the size of such objects without knowledge of the objects themselves.

The following attributes sets for printing as an extension to the Basic Grayscale Image Box SOP class – N-SET DIMSE attribute list (ref. section 4.2.7.3.1.6 SOP Specific Conformance for Basic Grayscale Image Box SOP Class).

Table 156: Patient Root Query/Retrieve Information Model

Attribute Name	Tag	VR	Notes
Planar Configuration	0028,0006	US	
Window Center	0028,1050	DS	
Window Width	0028,1051	DS	

8.5.1. Private Transfer Syntaxes

No Private Transfer Syntaxes are supported.