DICOM
Conformance Statement

xLNA Enterprise Rel. 2.0
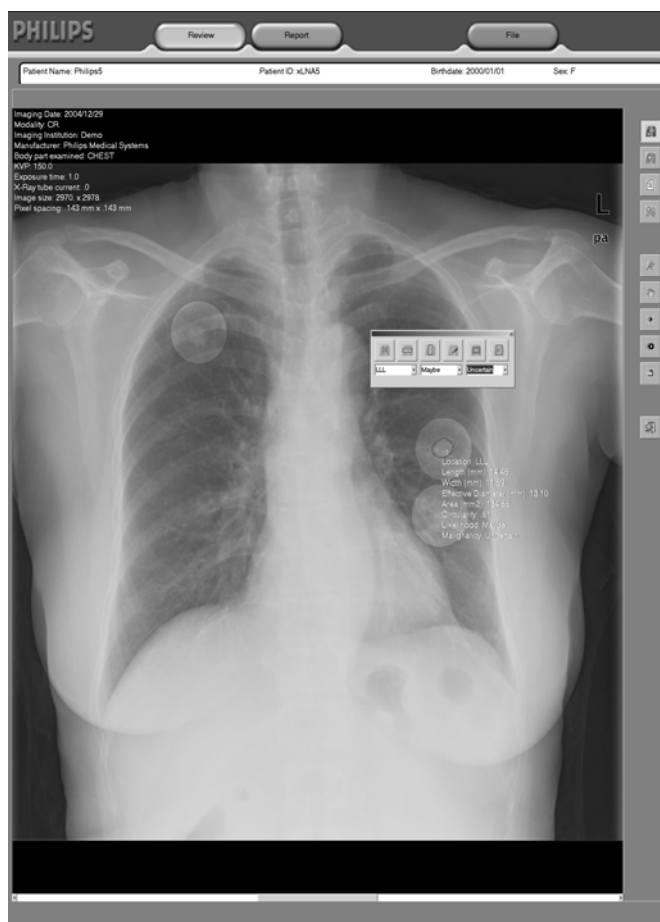
PHILIPS

1. DICOM CONFORMANCE STATEMENT OVERVIEW

xLNA Enterprise System imports X-Ray images from the PACS, performs a ROI analysis to identity and mark the lung nodules, generates the Diagnostic X-Ray report and exports them to PACS.

A table of Supported Networking DICOM Service (SOP) Classes is provided with roles (User/Provider)
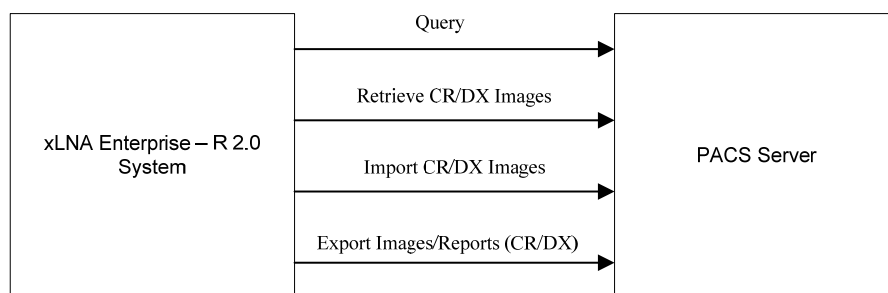

Figure 1: Application Flow Diagram

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Other			
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Query/Retrieve			
Study Root Query/Retrieve Information Model - FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model - MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Yes	No
Transfer			
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes

The services can be specified as a SCU, SCP or as an Option, which means that it is either configurable or that it can be purchased separately.

No Media Storage Application Profiles are supported by the xLNA Enterprise System

2. TABLE OF CONTENTS

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 2: Revision History

Document Version	Date of Issue	Author	Description
00	27 April 2007	PMS CTO C&S IC2	Approved version

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.

AE	Application Entity
ANSI	American National Standard Institute
AP	Application Profile
CR	Computed Radiography
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
DX	Digital X-Ray
EBE	DICOM Explicit VR Big Endian
ELE	DICOM Explicit VR Little Endian
GUI	Graphic User Interface
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
RWA	Real-World Activity
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/ Internet Protocol
UID	Unique Identifier
xLNA	X-Ray Lung Nodule Assessment

3.5.   References

[DICOM]   Digital Imaging and Communications in Medicine, 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
             Internet: http://medical nema.org/
             Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2007) plus all the supplements and correction items that have been approved as Final Text.

4. NETWORKING

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

4.1. Implementation model

The implementation model consists of three sections:
- The application data flow diagram, specifying the relationship between the Application Entities and the "external world" or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1. Application Data Flow
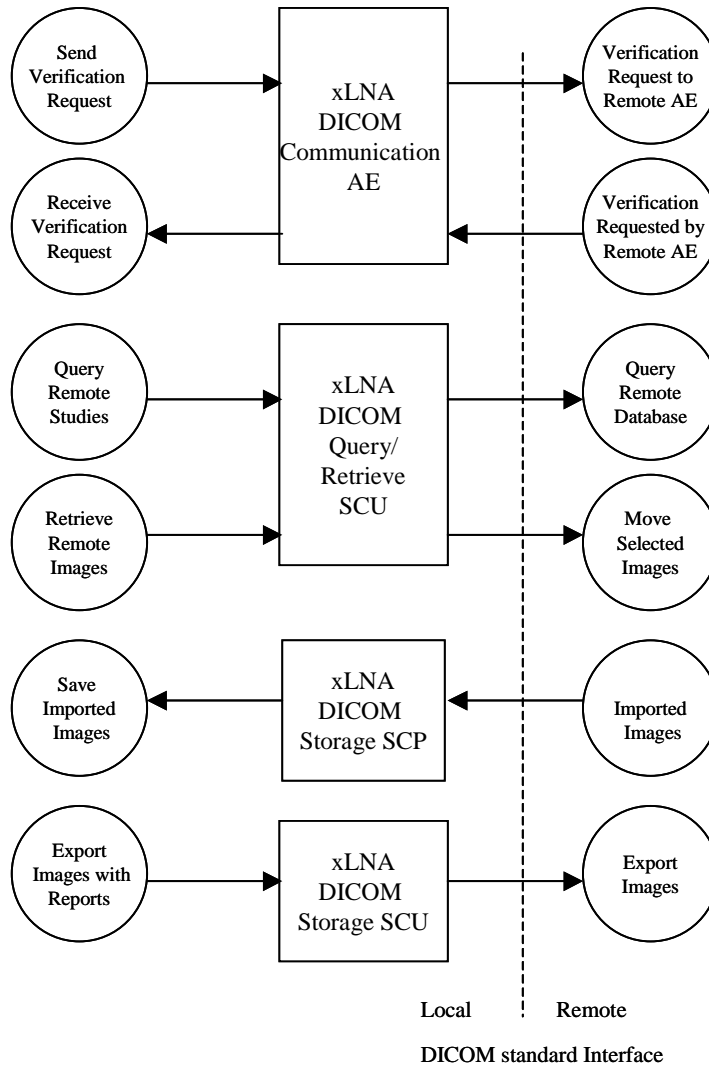
Figure 2: Application Data Flow Diagram

The xLNA Enterprise system is a single Windows based application that provides both user interface, internal database and the network listener.

The network services are modeled as the following Application Entities (AEs).

- xLNA DICOM Communication AE, which receives verification requests and responds to them as well as sends verification requests to other remote AEs and receives the response from them.
- xLNA DICOM Query/Retrieve SCU, which queries remote AEs for the list of studies, series and instances and retrieves, selected studies, series or instances.
- xLNA DICOM Storage SCP, which receives incoming images and other composite instances.
- xLNA DICOM Storage SCU, which sends outgoing images and other composite instances.

4.1.2. Functional Definition of AEs

This section contains a functional definition for each individual 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 Association Services.

4.1.2.1. Functional Definition of xLNA DICOM Communication AE

xLNA DICOM Communication AE, as an SCP, waits in the background for connections, will accepts associations with Presentation Contexts for the SOP class of the Verification SOP class, and will respond successfully to echo requests. xLNA DICOM Communication AE, as an SCU, is activated through the user interface when a user selects a remote AE and tries to do an application level verification with the Presentation Contexts for Verification Service Class.

4.1.2.2. Functional Definition of xLNA DICOM Query/Retrieve SCU

xLNA DICOM Query/retrieve automatically does query and retrieval of a remote database based CR/DX modality, date setting and query frequency selected.

4.1.2.3. Functional Definition of xLNA DICOM Storage SCP

xLNA DICOM Storage SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP classes of the Storage Service Class, and will store the received instances to the local database where they may subsequently be listed and viewed through the user interface.

4.1.2.4. Functional Definition of xLNA DICOM Storage SCU

xLNA DICOM Storage SCU is activated through the user interface when a user selects instances from the local database, or the currently displayed instance and requests to send them to a Remote AE.

4.1.3. Sequencing of Real World Activities

All SCP activities are performed asynchronously in the background and not dependent on any sequencing.

All SCU activities are initiated in the user interface and another activity may not be initiated until the prior activity has completed.

4.2.   AE Specifications

The next section in the DICOM Conformance Statement is a set of application entity specifications. There are as many of these subsections as there are different AE's in the implementation.

4.2.1. xLNA DICOM Communication AE

Detail of this specific Application Entity is specified in this section.

4.2.1.1. SOP Classes

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

Table 3: SOP Classes for xLNA DICOM Communication AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.1.2. Association Policies

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

4.2.1.2.1.   General

The DICOM standard application context has specified.

Table 4: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2.   Number of Associations

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 5: Number of Associations as an Association Initiator for xLNA DICOM Communication AE

Maximum number of simultaneous associations	1

Table 6: Number of Associations as an Association Acceptor for xLNA DICOM Communication AE

Maximum number of simultaneous associations	1

4.2.1.2.3.   Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 7: Asynchronous Nature as an Association Initiator for xLNA DICOM Communication AE

Maximum number of outstanding asynchronous transactions	None

4.2.1.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 8: DICOM Implementation Class and Version for xLNA DICOM Communication AE

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.3
Implementation Version Name	OFFIS_DCMTK_353

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 9: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The reason is logged

4.2.1.3. Association Initiation Policy

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

The behavior of the AE during association rejection is summarized in next table

Table 10: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

The behavior of the AE on receiving an association abort is summarized in next table

Table 11: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

The behavior of the AE for sending an association abort is summarized in next table.

Table 12: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

4.2.1.3.1. (Real-World) Activity – Verification as SCU

4.2.1.3.1.1. Description and Sequencing of Activities
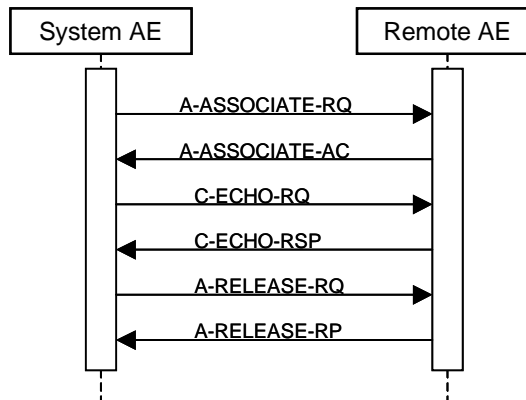
Figure 3: (Real World) Activity - Verification as SCU

4.2.1.3.1.2. Proposed Presentation Contexts

**Table 13: Proposed Presentation Contexts for (Real-World) Activity –
Verification as SCU**

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	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The Proposed presentation contexts are mentioned in the above table.
No Extended negotiations are supported.

4.2.1.3.1.3. SOP Specific Conformance for Verification SOP Class

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

4.2.1.3.1.3.1.   Dataset Specific Conformance for Verification C-ECHO SCU

This section includes the dataset specific behavior, i.e. error codes, error and
exception handling, time-outs, etc.

Table 14: C-ECHO-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Confirmation	Confirm the verification request

Table 15: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	The verification request fails. The reason is logged.
Reply Time-out	The verification request fails and association is aborted The reason is logged
Association Time-out SCU	The association is released.
Association aborted	The verification request fails. The reason is logged.

4.2.1.4. Association Acceptance Policy

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

The behavior of the AE during association rejection is summarized in next table

Table 16: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

The behavior of the AE on receiving an association abort is summarized in next table

Table 17: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

The behavior of the AE for sending an association abort is summarized in next table.

Table 18: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

4.2.1.4.1.   (Real-World) Activity – Verification as SCP

4.2.1.4.1.1. Description and Sequencing of Activities
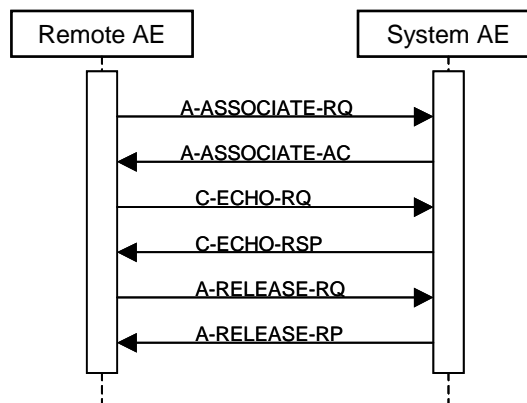
Figure 4: (Real World) Activity - Verification as SCP

4.2.1.4.1.2. Accepted Presentation Contexts

Table 19: Acceptable Presentation Contexts for (Real-World) Activity – Verification as SCP

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	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Accepted Presentation Contexts are mentioned in the above table.
No extended negotiations are supported.

4.2.1.4.1.3. SOP Specific Conformance for Verification SOP Class

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc.
The behavior of an Application Entity SOP class is summarized as shown in next Table . The standard as well as the manufacturer specific status codes and their corresponding behavior is specified.

4.2.1.4.1.3.1.   Dataset Specific Conformance for Verification C-ECHO SCP

This section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 20: C-ECHO-RSP Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Confirmation	Confirm the verification request

Table 21: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	The verification request fails. The reason is logged.
Reply Time-out	The verification request fails and association is aborted The reason is logged
Association Time-out SCU	The association is released.
Association aborted	The verification request fails. The reason is logged.

4.2.2. xLNA DICOM QueryRetrieve SCU

Detail of this specific Application Entity is specified in this section.

4.2.2.1. SOP Classes

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

Table 22: SOP Classes for xLNA DICOM QueryRetrieve SCU

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

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.2.2. Association Policies

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

4.2.2.2.1. *General*

The DICOM standard application context has specified.

Table 23: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2. *Number of Associations*

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 24: Number of Associations as an Association Initiator for xLNA DICOM QueryRetrieve SCU

Maximum number of simultaneous associations	1

Table 25: Number of Associations as an Association Acceptor for xLNA DICOM QueryRetrieve SCU

Maximum number of simultaneous associations	1

4.2.2.2.3. *Asynchronous Nature*

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 26: Asynchronous Nature as an Association Initiator for xLNA DICOM QueryRetrieve SCU

Maximum number of outstanding asynchronous transactions	None

4.2.2.2.4. *Implementation Identifying Information*

The value supplied for Implementation Class UID and version name are documented here.

Table 27: DICOM Implementation Class and Version for xLNA DICOM QueryRetrieve SCU

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.3
Implementation Version Name	OFFIS_DCMTK_353

4.2.2.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 28: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The reason is logged

4.2.2.3. Association Initiation Policy

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

The behavior of the AE during association rejection is summarized in next table

Table 29: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

The behavior of the AE on receiving an association abort is summarized in next table

Table 30: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged

Source	Reason/Diagnosis	Behavior
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

The behavior of the AE for sending an association abort is summarized in next table.

Table 31: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

4.2.2.3.1.   (Real-World) Activity – FIND As SCU

4.2.2.3.1.1. Description and Sequencing of Activities
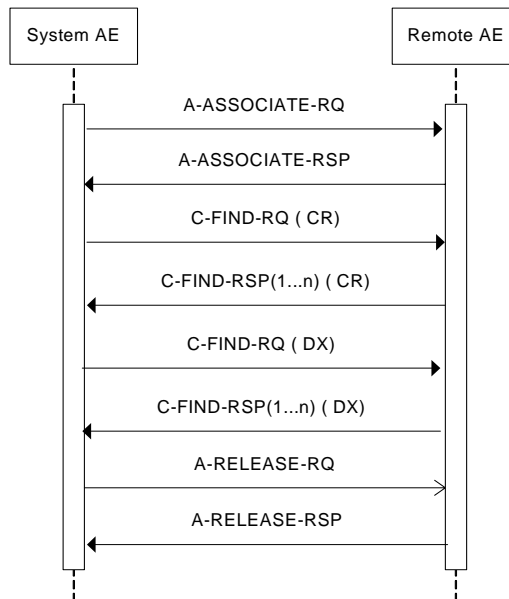
Figure 5: (Real World) Activity - FIND As SCU

- Local AE initiates an association to a remote entity

- Local AE sends C_FIND_RQ with the query conditions from the GUI input of xLNA Enterprise system.
- After receiving the C_FIND responses from the Remote AE, the local AE displays query results on the GUI of xLNA Enterprise system.
- Local application entity then closes the association by sending A_RELEASE_RQ and receiving back A_RELEASE_RSP from Remote AE.

4.2.2.3.1.2. Proposed Presentation Contexts

Table 32: Proposed Presentation Contexts for (Real-World) Activity – FIND As SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The above table shows the proposed presentation context
No extended negotiations are supported.

4.2.2.3.1.3. SOP Specific Conformance for Study Root Query/Retrieve Information Model - FIND SOP Class

The xLNA DICOM Query/Retrieve SCU provides standard conformance to Query/Retrieve Service Class.

4.2.2.3.1.3.1. Dataset Specific Conformance for Study Root Q/R Information Model - FIND SOP Class SCU

This section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 33: Supported Query Keys for

Attribute Name	Tag	VR	Type Of Matching	Comment
Query/Retrieve Level	0008,0052	CS	Single Value	Study level
Q/R Study level (Study Root)				
Study Instance UID	0020,000D	UI	Universal	Study level
Study Date	0008,0020	DA	Universal	Study level
Study Time	0008,0030	TM		
Accession Number	0008,0050	SH		
Modalities in Study	0008,0061	CS	Universal	Study level, CR, DX

Attribute Name	Tag	VR	Type Of Matching	Comment
Referring Physician's Name	0008,0090	PN		
Study Description	0008,1030	LO		
Patient's Name	0010,0010	PN	Single Value,Universal,WildCard	Study level
Patient ID	0010,0020	LO	Single Value,Universal,WildCard	Study level
Patient's Birth Date	0010,0030	DA		
Patient's Sex	0010,0040	CS		
Other Patient IDs	0010,1000	LO		
Other Patient Names	0010,1001	PN		
Study ID	0020,0010	SH	Universal	Study level

Table 34: C-FIND-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Matching is complete	The find results are displayed.
Refused	A700	Out of Resources	No find results are displayed. The reason is logged.
Failed	A900	Identifiers does not match SOP class	No find results are displayed. The reason is logged.
	Cxxx	Unable to process	No find results are displayed. The reason is logged.
Cancel	FE00	Matching terminated due to Cancel Request	No find results are displayed. The reason is logged.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys.	The find command continues.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	The find command continues.

Table 35: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	N/A
Reply Time-out	The query fails and the association is aborted. The reason is logged.
Association Time-out SCU	The association is released.
Association aborted	The query fails. The reason is logged.

4.2.2.3.2. (Real-World) Activity – MOVE As SCU

4.2.2.3.2.1. Description and Sequencing of Activities
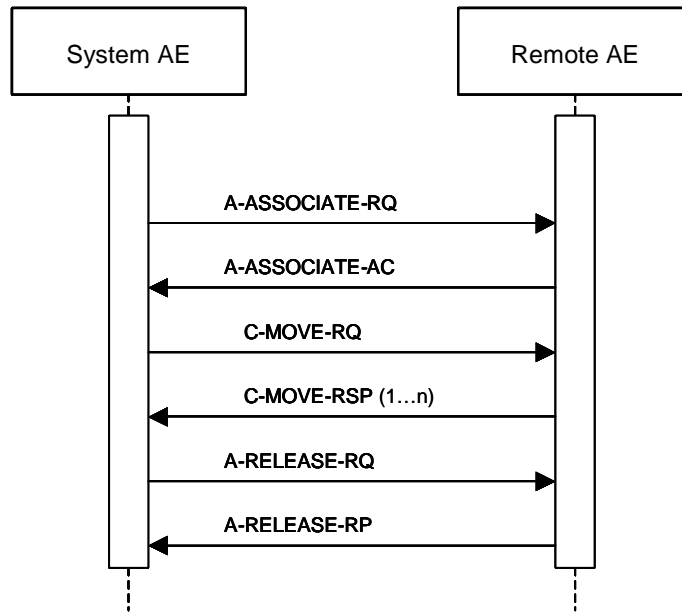
Figure 6: (Real World) Activity - MOVE As SCU

- Local AE initiates an association to a remote entity
- Local AE sends a C_MOVE_RQ to the remote AE automatically.
- Remote entity responds with C_MOVE operation
- Local AE receives DICOM images and stores them to local database.

4.2.2.3.2.2. Proposed Presentation Contexts

Table 36: Proposed Presentation Contexts for (Real-World) Activity – MOVE As SCU

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model - MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The above table shows the proposed presentation context
No extended negotiations are supported.

4.2.2.3.2.3. SOP Specific Conformance for Study Root Query/Retrieve Information Model - MOVE SOP Class

The xLNA DICOM Query/Retrieve SCU provides standard conformance to Query/Retrieve Service Class

4.2.2.3.2.3.1. Dataset Specific Conformance for Study Root Query/Retrieve Information Model - MOVE SOP Class SCU

This section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 37: Identifiers for MOVE SCU

Attribute Name	Tag	VR	Comment
Study Root Information Model			
Query/Retrieve Level	0008,0052	CS	
Q/R Study level (Study Root)			
Study Instance UID	0020,000D	UI	Study Level

Table 38: C-MOVE-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Sub-operations complete-No Failures	The move job is marked as completed. The association is released.
Refused	A701	Out of Resources-Unable to calculate number of matches	The move job is marked as failed. The association is released. The reason is logged.
	A702	Out of Resources – Unable to perform sub-operations	The move job is marked as failed. The association is released. The reason is logged.
	A801	Move Destination unknown	The move job is marked as failed. The association is released. The reason is logged.
Failed	A900	Identifier does not match SOP class	The move job is marked as failed. The association is released. The reason is logged.
	Cxxx	Unable to process	The move job is marked as failed. The association is released. The reason is logged.
Cancel	FE00	Sub-operations terminated due to Cancel Indication	The move job is marked as failed. The association is released. The reason is logged.
Warning	B000	Sub-operations complete – One or more Failures	The move job is marked as completed. The association is released.
Pending	FF00	Sub-operations are continuing.	The move job continues.

Table 39: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	The move job fails in case of association setup. The reason is logged.
Reply Time-out	The move job fails and the association is aborted. The reason is logged.
Association Time-out SCU	N/A
Association aborted	The move job fails. The reason is logged and.

4.2.2.4. Association Acceptance Policy

The xLNA DICOM Query/Retrieve SCU does not accept associations.

4.2.3. xLNA DICOM Storage SCP

Detail of this specific Application Entity is specified in this section.

4.2.3.1. SOP Classes

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

Table 40: SOP Classes for xLNA DICOM Storage SCP

SOP Class Name	SOP Class UID	SCU	SCP
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	No	Yes

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.3.2. Association Policies

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

4.2.3.2.1. General

The DICOM standard application context has specified.

Table 41: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2. Number of Associations

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 42: Number of Associations as an Association Initiator for xLNA DICOM Storage SCP

Maximum number of simultaneous associations	0

Table 43: Number of Associations as an Association Acceptor for xLNA DICOM Storage SCP

Maximum number of simultaneous associations	1

4.2.3.2.3. Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 44: Asynchronous Nature as an Association Initiator for xLNA DICOM Storage SCP

Maximum number of outstanding asynchronous transactions	None

4.2.3.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 45: DICOM Implementation Class and Version for xLNA DICOM Storage SCP

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.3
Implementation Version Name	OFFIS_DCMTK_353

4.2.3.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 46: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The reason is logged

4.2.3.3. Association Initiation Policy

The xLNA DICOM Storage SCP does not initiate associations.

4.2.3.4. Association Acceptance Policy

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

The behavior of the AE during association rejection is summarized in next table

Table 47: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

The behavior of the AE on receiving an association abort is summarized in next table

Table 48: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

The behavior of the AE for sending an association abort is summarized in next table.

Table 49: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

4.2.3.4.1. (Real-World) Activity – Image Import

4.2.3.4.1.1. Description and Sequencing of Activities
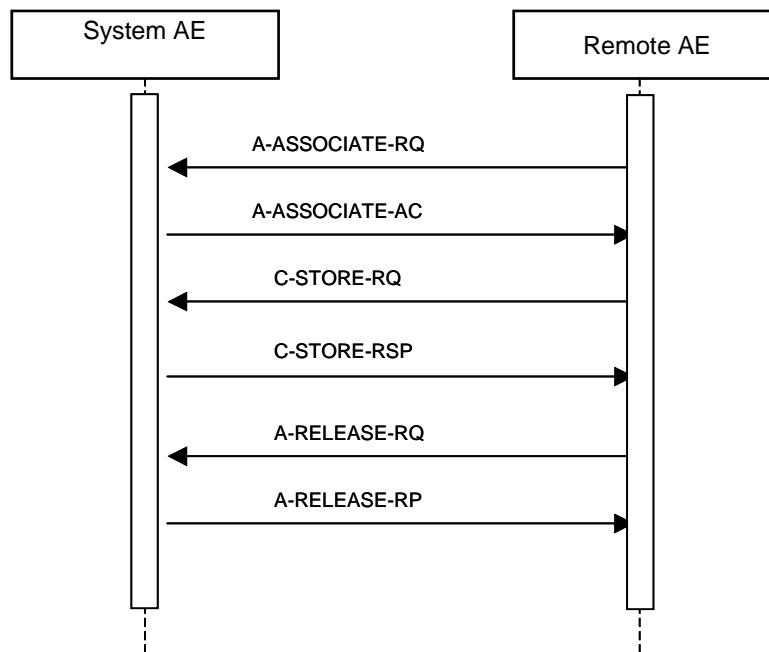
Figure 7: (Real World) Activity - Image Import

- Remote AE initiates a DICOM association with the Local AE
- Local AE (Storage SCP) responds to the Remote AE and selects a matching Presentation Context.
- Remote AE sends a C-STORE-RQ
- Local AE accepts the request and stores incoming DICOM image, CR or DX image, into the local database

4.2.3.4.1.2. Accepted Presentation Contexts

Table 50: Acceptable Presentation Contexts for (Real-World) Activity – Image Import

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCP	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		

The supported presentation contexts are shown in the above table.
No extended negotiations are supported.

4.2.3.4.1.3. SOP Specific Conformance for Storage SOP Classes

The xLNA DICOM Storage SCP conforms to the SOP Storage Class at Level 1 (base). It does not provide Digital Signature support. No elements are discarded or coerced by xLNA Enterprise System. When a C_STORE operation is successful, images are saved to the xLNA local database. Any image whose SOP Instance UID (0008, 0018) already exists in the local database will not be imported into the database.

The xLNA DICOM Storage SCP responds to a C_STORE_RQ with one of the response codes listed in the table below
.

Table 51: C-STORE-RSP Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Storage is complete	The image(s) will be stored in the local database
Refused	A700	Out of Resources	The local database is full.
Error	A900	Data set does not match the SOP class	The SOP class of the image(s) does not match the negotiated abstract syntax.
	C000	Cannot understand	The image(s) cannot be parsed.
Warning	B000	Coercion of Data Elements	NA
	B006	Elements discarded	NA

Service Status	Code	Further Meaning	Description
	B007	Data set does not match SOP class	NA

Table 52: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	The store job fails in case of association setup. The reason is logged.
Reply Time-out	The store job fails and association is aborted The reason is logged
Association Time-out SCU	The association is released.
Association aborted	The store job fails. The reason is logged.

4.2.4. xLNA DICOM Storage SCU

Detail of this specific Application Entity is specified in this section.

4.2.4.1. SOP Classes

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

Table 53: SOP Classes for xLNA DICOM Storage SCU

SOP Class Name	SOP Class UID	SCU	SCP
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	Yes	No
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	Yes	No

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.4.2. Association Policies

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

4.2.4.2.1. General

The DICOM standard application context has specified.

Table 54: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2. Number of Associations

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 55: Number of Associations as an Association Initiator for xLNA DICOM Storage SCU

Maximum number of simultaneous associations	1

Table 56: Number of Associations as an Association Acceptor for xLNA DICOM Storage SCU

Maximum number of simultaneous associations	0

4.2.4.2.3. Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 57: Asynchronous Nature as an Association Initiator for xLNA DICOM Storage SCU

Maximum number of outstanding asynchronous transactions	None

4.2.4.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 58: DICOM Implementation Class and Version for xLNA DICOM Storage SCU

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.3
Implementation Version Name	OFFIS_DCMTK_353

4.2.4.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 59: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The reason is logged

4.2.4.3. Association Initiation Policy

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

The behavior of the AE during association rejection is summarized in next table

Table 60: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

Result	Source	Reason/Diagnosis	Behavior
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Association is not established. The reason is logged
		2 – application-context-name-not-supported	Association is not established. The reason is logged
		3 – calling-AE-title-not-recognized	Association is not established. The reason is logged
		7 – called-AE-title-not-recognized	Association is not established. The reason is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Association is not established. The reason is logged
		2 – protocol-version-not-supported	Association is not established. The reason is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Association is not established. The reason is logged
		2 – local-limit-exceeded	Association is not established. The reason is logged

The behavior of the AE on receiving an association abort is summarized in next table

Table 61: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

The behavior of the AE for sending an association abort is summarized in next table.

Table 62: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Association is not established. The reason is logged
2 – DICOM UL service-provider	0 – reason-not-specified	Association is not established. The reason is logged
	1 – unrecognized-PDU	Association is not established. The reason is logged
	2 – unexpected-PDU	Association is not established. The reason is logged
	4 – unrecognized-PDU parameter	Association is not established. The reason is logged
	5 – unexpected-PDU parameter	Association is not established. The reason is logged
	6 – invalid-PDU-parameter value	Association is not established. The reason is logged

4.2.4.3.1. (Real-World) Activity – Image Export

4.2.4.3.1.1. Description and Sequencing of Activities
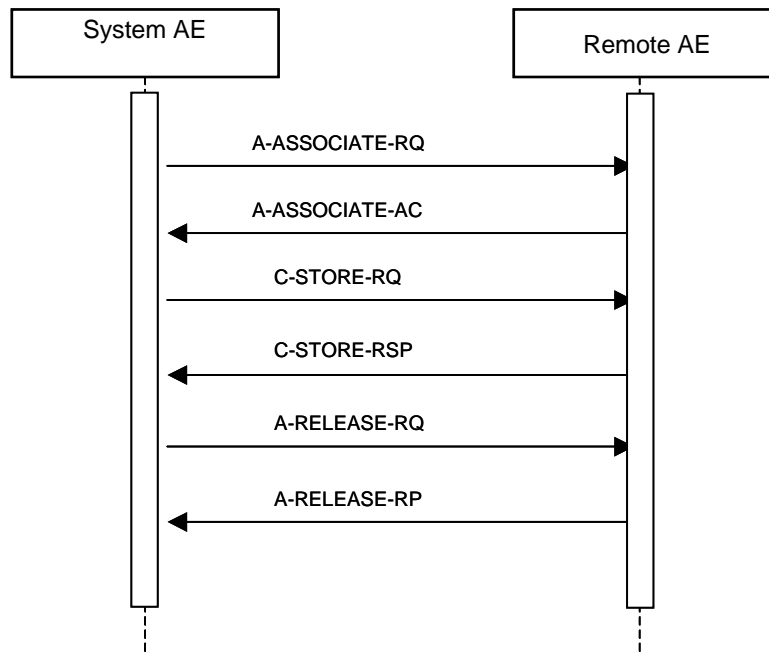
Figure 8: (Real World) Activity - Image Export

- Local AE (Storage SCU) initiates an association to Remote AE.
- Local AE sends a C-STORE-RQ to the Remote AE for exporting the CR and DX images.
- Remote AE responds to storage request with appropriate responses.
- Local AE closes the association.

4.2.4.3.1.2. Proposed Presentation Contexts

Table 63: Proposed Presentation Contexts for (Real-World) Activity – Image Export

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

The proposed presentation contexts are mentioned in the above table
No extended negotiations are supported

4.2.4.3.1.3. SOP Specific Conformance for Storage SOP Classes

The xLNA DICOM Storage SCU provides standard conformance to the Storage Service Class.
The maximum PDU size used by xLNA DICOM SCU is 64K.

Table 64: C-STORE-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Storage is complete	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
Refused	A7xx	Out of Resources	The store job fails and the association is released. The reason is logged
Error	A9xx	Data set does not match SOP class	The store job fails and the association is released. The reason is logged
	Cxxx	Cannot understand	The store job fails and the association is released. The reason is logged
Warning	B000	Coercion of Data Elements	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
	B006	Elements discarded	Continues with next store until completed thereafter the store job is marked as completed and the association is released.
	B007	Data set does not match SOP class	Continues with next store until completed thereafter the store job is marked as completed and the association is released.

Table 65: DICOM Command Communication Failure Behavior

Exception	Behavior
ARTIM Time-out	The store job fails in case of association setup. The reason is logged.
Reply Time-out	The store job fails and association is aborted The reason is logged
Association Time-out SCU	The association is released.
Association abort ed	The store job fails. The reason is logged.

4.2.4.4. ssociation Acceptance Policy

The xLNA DICOM Storage SCU does not accept associations.

4.3. Network Interfaces

4.3.1. Physical Network Interfaces

The xLNA Enterprise System provides DICOM 3.0 TCP/IP Network Communication Support as defined in the Part 8 of the DICOM standard.
The DICOM implementation operates on the top of the TCP/IP stack, and does not have specific requirement regarding the physical network media. The default connection port is the Ethernet.

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

Common network media supported by DICOM include
Token Ring,
FDDI
ATM
ISDN
T1, T3 and other types of digital or digital Audio lines

4.3.2. Additional Protocols

xLNA Enterprise System supports TCP/IP.

4.4. Configuration

Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration is addressed in this section.

4.4.1. AE Title/Presentation Address Mapping

The Local AE title can be configured by authorized personnel only. Configurations may be changed through the GUI of the xLNA System Configuration program.

4.4.1.1. Local AE Titles

The local AE title mapping and configuration are specified.

Table 66: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
xLNA DICOM Query/Retrieve SCU	xLNA DICOM Query/Retrieve SCU	1949
xLNA DICOM Storage SCP	xLNA DICOM Storage SCP	1949
xLNA DICOM Storage SCU	xLNA DICOM Storage SCU	1949
xLNA DICOM communication AE	xLNA DICOM communication AE	1849

The TCP/IP port of the AEs can be configurable between 104 to 65535

4.4.1.2. Remote AE Title/Presentation Address Mapping

Configuration of remote host names and port numbers shall be specified here.

Application Entity	IP	TCP/IP Port
Query/Retrieve (Maximum 16 bytes)	Configurable	Configurable
Remote Push (Maximum 16 bytes)	Configurable	Configurable
Report Export (Maximum 16 bytes)	Configurable	Configurable
Verification (Maximum 16 bytes)	Configurable	Configurable

.

4.4.2. Parameters

The specification of important operational parameters, their default value and range (if configurable) is specified here.

Table 67: Configuration Parameters table

Parameter	Configurable	Default Value
General Parameters		
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	None
General DIMSE level time-out values	No	None
Time-out waiting for response to TCP/IP connect request. (Low-level timeout)	No	None
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	None
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	1000 s
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	30 s
AE Specific Parameters		
Size constraint in maximum object size (see note 1)	No	None
Maximum PDU size the AE can receive	No	32 KB
Maximum PDU size the AE can send	No	16 KB
AE specific DIMSE level time-out values	No	None
STORAGE –SCP support SOP Class:	Yes	1.2.840.10008.5.1.4.1 .1.1 / 1.2.840.10008.5.1.4.1 .1.1.1
STORAGE –SCU support SOP Class	Yes	1.2.840.10008.5.1.4.1 .1.1 / 1.2.840.10008.5.1.4.1 .1.1.1
QUERY-RETRIEVE_SCU support SOP Class	No	1.2.840.10008.5.1.4.1 .2.2.1 / 1.2.840.10008.5.1.4.1 .2.2.2
STORAGE-SCP/STORAGE-SCU/QUERY-RETRIEVE-SCU Transfer Syntax	Yes	1.2.840.10008.1.2.1

5. MEDIA INTERCHANGE

Not Applicable.

6. SUPPORT OF CHARACTER SETS

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

Table 68: Supported DICOM Character Sets of xLNA System

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
GB18030	GB18030	-	-	-	-
		-	-	-	-
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859

7. SECURITY

Not Applicable.

8. ANNEXES OF APPLICATION "XLNA"

8.1. IOD Contents

8.1.1. Created SOP Instance

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 shall be specified.

Abbreviations used in the IOD tables for the column "Presence of Module" are:
ALWAYS   The module is always present
CONDITIONAL   The module is used under specified condition

Abbreviations used in the Module table for the column "Presence of Value" are:
ALWAYS   The attribute is always present with a value
EMPTY   The attribute is always present without any value (attribute sent zero length)
VNAP   The attribute is always present and its Value is Not Always Present (attribute sent zero length if no value is present)
ANAP   The attribute is present under specified condition – if present then it will always have a value
ANAPCV   The attribute is present under specified condition – if present then its Value is Not Always Present (attribute sent zero length if condition applies and no value is present)
ANAPEV   The attribute is present under specified condition – if present then it will not have any value

The abbreviations used in the Module table for the column "Source" are:
AUTO   The attribute value is generated automatically
CONFIG   The attribute value source is a configurable parameter
COPY   The attribute value source is another SOP instance
FIXED   The attribute value is hard-coded in the application
IMPLICIT   The attribute value source is a user-implicit setting
MPPS   The attribute value is the same as that use for Modality Performed Procedure Step
MWL   The attribute value source is a Modality Worklist
USER   The attribute value source is explicit user input

8.1.1.1. List of created SOP Classes

Table 69: List of created SOP Classes

SOP Class Name	SOP Class UID
Digital X-Ray Image Storage - For Pres. SOP	1.2.840.10008.5.1.4.1.1.1.1
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1

xLNA system generates the bar coded image and report document for the CR and DX Image SOP classes.

8.1.1.2. Digital X-Ray Image Storage - For Pres. SOP

The following tables lists the DICOM attributes created by the xLNA application for the Digital X-Ray bar coded image and Digital X-Ray Report document

Table 70: IOD of Created Digital X-Ray Image Storage - For Pres. SOP Instances

Information Entity	Module	Presence Of Module
Image	X-Ray Generation Module	ALWAYS
Image	DX Anatomy Imaged Module	ALWAYS
Image	DX Detector Module	ALWAYS
Image	DX Positioning Module	ALWAYS
Series	DX Series Module	ALWAYS
Image	X-Ray Acquisition Dose Module	ALWAYS
Image	X-Ray Grid Module	ALWAYS
Image	DX Image Module	ALWAYS
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Study	Patient Study Module	ALWAYS
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	SOP Common Module	ALWAYS
Image	VOI LUT Module	OPTIONAL
	Additional Module	OPTIONAL

Table 71: DX Anatomy Imaged Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Anatomic Region Sequence	0008,2218	SQ		VNAP	AUTO	
>Anatomic Region Modifier Sequence	0008,2220	SQ		ANAP	AUTO	
>>Code Value	0008,0100	SH		ALWAYS	AUTO	
>>Coding Scheme Designator	0008,0102	SH		ALWAYS	AUTO	
>>Code Meaning	0008,0104	LO		ALWAYS	AUTO	
Image Laterality	0020,0062	CS		ALWAYS	AUTO	

Table 72: DX Detector Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Imager Pixel Spacing	0018,1164	DS		ALWAYS	AUTO	
Field of View Origin	0018,7030	DS		ANAPEV	AUTO	
Field of View Rotation	0018,7032	DS		ANAPEV	AUTO	
Field of View Horizontal Flip	0018,7034	CS		ANAPEV	AUTO	
Detector Type	0018,7004	CS		VNAP	AUTO	
Sensitivity	0018,6000	DS		ANAP	AUTO	

Table 73: DX Positioning Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Positioner Type	0018,1508	CS		VNAP	AUTO	
View Position	0018,5101	CS	EDDA	ANAP	AUTO	

Table 74: DX Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	DX	ALWAYS	AUTO	
Presentation Intent Type	0008,0068	CS	FOR PRESENTATION	ALWAYS	AUTO	

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Performed Procedure Step Sequence	0008,1111	SQ		ANAPEV	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ANAPEV	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAPEV	AUTO	
>Referenced SOP Class UID	0008,1150	UI		ANAPEV	AUTO	
>Referenced SOP Instance UID	0008,1155	UI		ANAPEV	AUTO	

Table 75: DX Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED/ SECONDARY	ALWAYS	AUTO	
Patient Orientation	0020,0020	CS	A	ALWAYS	AUTO	
Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO	
Photometric Interpretation	0028,0004	CS	MONOCHROME 2	ALWAYS	AUTO	
Bits Allocated	0028,0100	US	16	ALWAYS	AUTO	
Bits Stored	0028,0101	US	12	ALWAYS	AUTO	
High Bit	0028,0102	US	11	ALWAYS	AUTO	
Pixel Representation	0028,0103	US	0	ALWAYS	AUTO	
Burned In Annotation	0028,0301	CS	No	ALWAYS	AUTO	
Pixel Intensity Relationship	0028,1040	CS	LOG	ALWAYS	AUTO	
Pixel Intensity Relationship Sign	0028,1041	SS	1	ALWAYS	AUTO	
Rescale Intercept	0028,1052	DS	0	ALWAYS	AUTO	
Rescale Slope	0028,1053	DS	1	ALWAYS	AUTO	
Rescale Type	0028,1054	LO	US	ALWAYS	AUTO	
Lossy Image Compression	0028,2110	CS	00	ALWAYS	AUTO	
Presentation LUT Shape	2050,0020	CS	IDENTITY	ALWAYS	AUTO	
Window Center	0028,1050	DS	127	ANAPEV	AUTO	
Window Width	0028,1051	DS	254	ANAPEV	AUTO	
Lossy Image Compression Ratio	0028,2112	DS	00	ANAPEV	AUTO	
Acquisition Device Processing Description	0018,1400	LO		ANAP	AUTO	
VOI LUT Sequence	0028,3010	SQ		ANAPEV	AUTO	
>LUT Descriptor	0028,3002	US /SS		ALWAYS	AUTO	
>LUT Data	0028,3006	US /SS		ALWAYS	AUTO	

Table 76: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
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	

Table 77: General Study Module

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

Table 78: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		ALWAYS	AUTO	
Laterality	0020,0060	CS		ANAPCV	AUTO	
Series Description	0008,103E	LO		ANAP	AUTO	
Body Part Examined	0018,0015	CS	CHEST or THORAX	ALWAYS	AUTO	

Table 79: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	EDDA	ALWAYS	AUTO	
Manufacturer's Model Name	0008,1090	LO	IQQA-Chest	ANAP	AUTO	

Table 80: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS		ALWAYS	AUTO	
Content Date	0008,0023	DA		ALWAYS	AUTO	
Content Time	0008,0033	TM		ALWAYS	AUTO	

Table 81: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Rows	0028,0010	US		ALWAYS	AUTO	
Columns	0028,0011	US		ALWAYS	AUTO	
Pixel Data	7FE0,0010	OW/ OB		ALWAYS	AUTO	
Planar Configuration	0028,0006	US		ANAPEV	AUTO	
Pixel Aspect Ratio	0028,0034	IS		ANAPEV	AUTO	
Red Palette Color Lookup Table Descriptor	0028,1101	US /SS		ANAPEV	AUTO	
Green Palette Color Lookup Table Descriptor	0028,1102	US /SS		ANAPEV	AUTO	
Blue Palette Color Lookup Table Descriptor	0028,1103	US /SS		ANAPEV	AUTO	
Red Palette Color Lookup Table Data	0028,1201	O W		ANAPEV	AUTO	
Green Palette Color Lookup Table Data	0028,1202	O W		ANAPEV	AUTO	
Blue Palette Color Lookup Table Data	0028,1203	O W		ANAPEV	AUTO	

Table 82: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAPEV	AUTO	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.1. 1	ALWAYS	AUTO	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

Table 83: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS		VNAP	AUTO	
Window Width	0028,1051	DS		VNAP	AUTO	

Table 84: Acquisition Context Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Acquisition Context Sequence	0040,0555	SQ		VNAP	AUTO	
>Concept Name Code Sequence	0040,A043	SQ		ALWAYS	AUTO	
>>Code Value	0008,0100	SH		ALWAYS	AUTO	
>>Coding Scheme Designator	0008,0102	SH		ALWAYS	AUTO	
>>Code Meaning	0008,0104	LO		ALWAYS	AUTO	

Table 85: Additional Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Pixel Spacing	0028,0030	DS	1,1	VNAP	AUTO	

8.1.1.3. Computed Radiography Image Storage SOP Class

The following tables lists the DICOM attributes created by the xLNA application for the Computed Radiography bar coded image and Computed Radiography Report document

Table 86: IOD of Created Computed Radiography Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Study	Patient Study Module	ALWAYS
Series	General Series Module	ALWAYS
Series	CR Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Contrast/Bolus Module	ALWAYS
Image	CR Image Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	SOP Common Module	ALWAYS
Image	VOI LUT Module	OPTIONAL
	Additional Module	OPTIONAL

Table 87: Patient Module

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

Table 88: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Instance UID	0020,000D	UI		ALWAYS	AUTO	

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

Table 89: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	CR	ALWAYS	AUTO	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		VNAP	AUTO	
Patient Position	0018,5100	CS	HFDR	ANAPCV	AUTO	
Laterality	0020,0060	CS	L, R	ANAPCV	AUTO	
Series Description	0008,103E	LO		ANAP	AUTO	

Table 90: CR Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Body Part Examined	0018,0015	CS	CHEST, THORAX	VNAP		
View Position	0018,5101	CS		VNAP		

Table 91: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	EDDA	VNAP	AUTO	
Manufacturer's Model Name	0008,1090	LO	IQQA-Chest	ANAP	AUTO	

Table 92: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS		ALWAYS	AUTO	
Content Date	0008,0023	DA		ALWAYS	AUTO	
Content Time	0008,0033	TM		ALWAYS	AUTO	
Patient Orientation	0020,0020	CS	F, L	ALWAYS	AUTO	

Table 93: CR Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	AUTO	

Table 94: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US	1	ALWAYS	AUTO	
Rows	0028,0010	US		ALWAYS	AUTO	
Columns	0028,0011	US		ALWAYS	AUTO	
Bits Allocated	0028,0100	US	16	ALWAYS	AUTO	
Bits Stored	0028,0101	US	12	ALWAYS	AUTO	
High Bit	0028,0102	US	11	ALWAYS	AUTO	
Pixel Representation	0028,0103	US	0000	ALWAYS	AUTO	
Pixel Data	7FE0,0010	OW/ OB		ALWAYS	AUTO	
Planar Configuration	0028,0006	US		ANAPEV	AUTO	

Pixel Aspect Ratio	0028,0034	IS		ANAPEV	AUTO	
Red Palette Color Lookup Table Descriptor	0028,1101	US /SS		ANAPEV	AUTO	
Green Palette Color Lookup Table Descriptor	0028,1102	US /SS		ANAPEV	AUTO	
Blue Palette Color Lookup Table Descriptor	0028,1103	US /SS		ANAPEV	AUTO	
Red Palette Color Lookup Table Data	0028,1201	O W		ANAPEV	AUTO	
Green Palette Color Lookup Table Data	0028,1202	O W		ANAPEV	AUTO	
Blue Palette Color Lookup Table Data	0028,1203	O W		ANAPEV	AUTO	

Table 95: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100,	VNAP	AUTO	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.1,	ALWAYS	AUTO	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

Table 96: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS	2048	ANAPEV	AUTO	
Window Width	0028,1051	DS	4096	ANAPEV	AUTO	

Table 97: Additional Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Pixel Spacing	0028,0030	DS	1,1	VNAP	AUTO	

8.1.2. Usage of Attributes from Received IOD

Not Applicable

8.1.3. Attribute Mapping

Not Applicable.

8.1.4. Coerced/Modified fields

None.

8.2. Data Dictionary of Private Attributes

Any private attributes shall be specified, including its VR and VM. Private SOP classes and transfer syntaxes shall be listed.

8.3. Coded Terminology and Templates

Not Applicable.

8.4. Grayscale Image consistency

Any support for the DICOM Grayscale Standard Display Function will be specified in this section.

8.5.   Standard Extended/Specialized/Private SOPs

Not Applicable

8.6.   Private Transfer Syntaxes

Not Applicable.