
QLAB 13.0

DICOM Conformance Statement

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1. Conformance Statement Overview

This document is the DICOM Conformance Statement for the Philips Medical Systems QLAB 13.0 system.

QLAB 13.0 provides a user environment to browse and view ultrasound exams by patient, study, and image. It also provides a user environment to select and launch an image, or set of images, to be quantified using a Q-App.

QLAB 13.0 supports import of DICOM data and limited data transfer capability. It provides, among other things, the following features:

- Verification of application level communication.
- Storage of image instances on a remote DICOM System.
- Import of image instances from a remote DICOM System
- Query and Retrieve of image instances from an external DICOM system (Q/R).
- Storage of image instances per DICOM Media on USB.

The following table provides an overview of all network services as provided by the QLAB 13.0.

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)	Display	Generate
Name	UID				
Other					
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes	N/A	N/A
Query/Retrieve					
Study Root QR Information Model - FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Yes	No	N/A	N/A
Study Root QR Information Model - MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Yes	No	N/A	N/A
Transfer					
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes	Yes	Yes
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes	Yes	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	Yes	No
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes	Yes	No
Comprehensive SR Storage SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes	Yes	Yes
Private 3D Presentation Stae Storage SOP Class	1.3.46.670589.2.5.1.1	Yes	Yes	Yes	Yes

All the supported Media Services by QLAB 13.0 are shown in table 2

Table 2: Media Services

Media Storage Application Profile	File-set Creator (FSC)	File-set Updater (FSU)	File-set Reader (FSR)
Compact Disk-Recordable			
USB			
General Purpose USB Media Interchange with JPEG	Yes	Yes	Yes

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3. Introduction

3.1. Revision History

Table 3: Revision History

Document Version	Date of Issue	Status	Description
01	30 May 2019	Approved	Final 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). 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

Table 4: Definitions, Terms and Abbreviations

Abbreviation/Term	Explanation
AE	Application Entity
ANSI	American National Standard Institute
BOT	Basic Offset Table
CD	Compact Disc
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
MWL	Modality Worklist
MPPS	Modality Performed Procedure Step
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
RWA	Real-World Activity
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

3.5. References

[DICOM] Digital Imaging and Communications in Medicine, Parts 1 - 21 (NEMA PS 3.1- PS 3.21), National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 900 Rosslyn, Virginia. 22209, United States of America
Internet: <https://www.dicomstandard.org/>

4. Networking

This section contains the networking related services.

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,
- The sequencing constraints among them.

4.1.1. Application Data Flow

The QLAB 13.0 system consists of one single application entity, the QLAB 13.0 Application Entity (QLAB AE).

The figure below shows the networking application data flow as a functional overview of the QLAB AE. On the left the local Real-World Activities are presented, whereas on the right the remote Real-World Activities are presented.

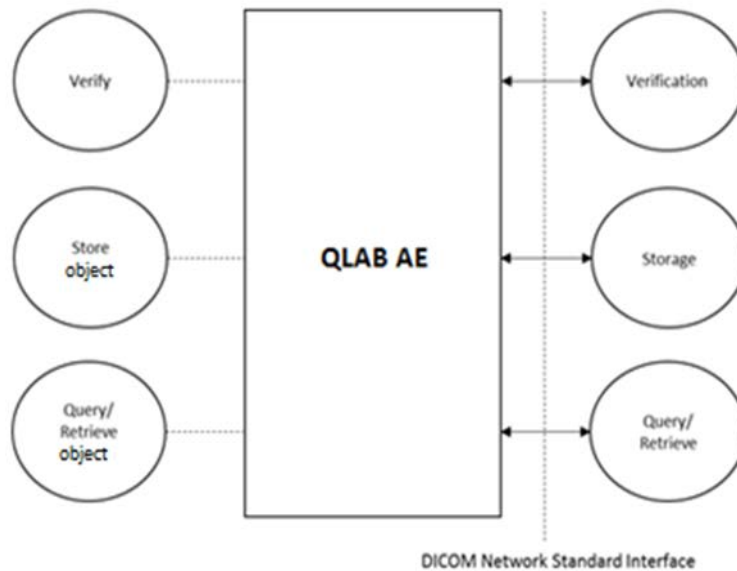


Figure 1: Application Data Flow Diagram

The QLAB 13.0 incorporates the following functionality:

- Import image, report, and 3D presentation state instances to a local database.
- Export image, report, and 3D presentation state instances from the local database to a network DICOM node.
- Query and retrieve image, report, and 3D presentation state instances from a remote DICOM node and to a remote node.

4.1.2. Functional Definition of AE's

This section contains a functional definition for each individual local Application Entity.

4.1.2.1. Functional Definition of QLAB AE

The QLAB AE is the one and only application entity within QLAB 13.0. It includes the following service classes.

- The QLAB AE can verify application level communication by using the verification service both as SCU and SCP (Verify).
- The QLAB AE can store image, report, and 3D presentation state instances by using the Storage service both as SCU and SCP (Store objects)
- The QLAB AE can find and move image, report, and 3D presentation state instances by using the Query/Retrieve service as SCU and SCP (Query/Retrieve objects).

4.1.3. Sequencing of Real World Activities

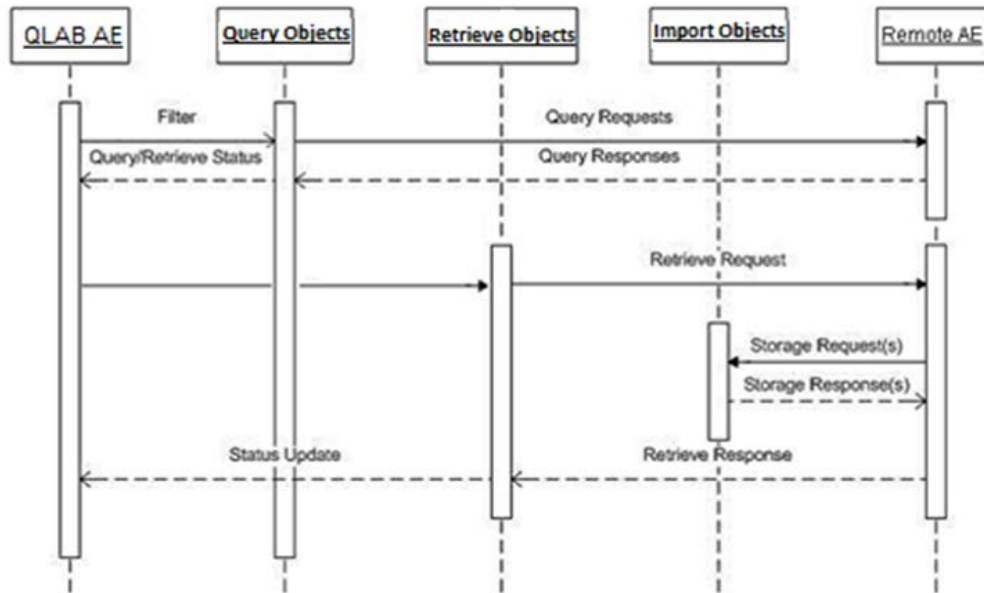


Figure 2 Sequence of Retrieve

4.2. AE Specifications

This 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. QLAB AE

Details 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 5: SOP Classes for QLAB AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	Yes	Yes
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Comprehensive SR Storage SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Private 3D Presentation State Storage SOP Class	1.3.46.670589.2.5.1.1	Yes	Yes
Study Root QR Information Model - FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root QR 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.

4.2.1.2. 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 is specified below.

Table 6: DICOM Application Context

Description	Value
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 an Initiator or Acceptor is specified here.

Table 7: Number of associations as an Association Initiator for this AE

Description	Value
Maximum number of simultaneous associations	No enforced limit

Table 8: Number of associations as an Association Acceptor for this AE

Description	Value
Maximum number of simultaneous associations	50

4.2.1.2.3. Asynchronous Nature

The implementation supports negotiation of multiple outstanding transactions, along with the maximum number of outstanding transactions supported.

Table 9: Asynchronous nature as an Association Initiator for this AE

Description	Value
Maximum number of outstanding asynchronous transactions	No enforced limit (Recommended value is 5)

4.2.1.2.4. Implementation Identifying Information

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

Table 10: DICOM Implementation Class and Version for QLAB AE

Implementation Class UID	1.3.46.670589.54.2.17.3
Implementation Version Name	17.3.0.0

4.2.1.2.5. Communication Failure Handling

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

Table 11: Communication Failure Behavior

Exception	Behavior
ARTIM Timeout	The association setup fails; the reason is logged and reported to the user.
Association aborted	The command is marked as failed. The reason is logged and reported to the user.

4.2.1.3. Association Initiation Policy

The Application Entity will respond to a received Association rejection as shown in the next table.

Table 12: Association Rejection response

Result	Source	Reason/Diagnosis	Behavior
1 - rejected-permanent	1 - DICOM UL service-user	1 - no-reason-given	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent,1: REJECT_SOURCE_dul_user,1: REJECT_REASON_no_reason_given)
		2 - application-context-name-not supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON_application_context_not_support)
		3 - calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON_calling_aetitle_not_recognized)
		7 - called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized)
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	Association is not established. The following error is logged. Error: UserRecoverable: impl.dicom.access.PEER: Associationrejected by peer (1: REJECT_RESULT_permanent, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given)
		2 - protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_application_context_not_support)
	3 - DICOM UL service-provider	1 - temporary-congestion	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_no_reason_given)

Result	Source	Reason/Diagnosis	Behavior
	(Presentation related function)	2 - local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (1: REJECT_RESULT_permanent, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_application_context_not_support)
2 - rejected-transient	1 - DICOM UL service-user	1 - no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 1: REJECT_REASON_no_reason_given)
		2 - application-context-name-not-supported	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 2: REJECT_REASON_application_context_not_support)
		3 - calling-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 3: REJECT_REASON_calling_aetitle_not_recognized)
		7 - called-AE-title-not-recognized	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 1: REJECT_SOURCE_dul_user, 7: REJECT_REASON_called_aetitle_not_recognized)
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 1: REJECT_REASON_no_reason_given)
		2 - protocol-version-not-supported	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 2: REJECT_SOURCE_dul_provider (acse), 2: REJECT_REASON_application_context_not_support)
	3 - DICOM UL service-provider (Presentation related function)	1 - temporary-congestion	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 1: REJECT_REASON_no_reason_given)
		2 - local-limit-exceeded	Association is not established. The following error is logged. Association rejected by peer (2: REJECT_RESULT_transient, 3: REJECT_SOURCE_dul_provider (presentation), 2: REJECT_REASON_application_context_not_support)

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

Table 13: Association Abort Handling

Source	Reason/Diagnosis	Behavior when received	Sent when
0 - DICOM UL service-user (initiated abort)	0- reason-not-specified	When received, the Q-Station 3.9 terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).	<ul style="list-style-type: none"> • N-EVENT-REPORT received with status FAILURE. • Abort is issued to an executing job that utilizes this network connection (ExportNetwork/ArchiveNetwork/DICOMCopy/DICOMMove) • Any other problem than ones specified for QLAB AESCU in the rows below. (Examples: Problem while decoding the DICOM stream, SCU was unable to send the Response to SCP, Error writing to SCU stream).
2 - DICOM UL service-provider (initiated abort)	0 - reason-not-specified	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)	<ul style="list-style-type: none"> • There are problems in SCU/SCP role negotiation. • Any other problem than ones specified for QLAB AESCU in the rows below. (Example: Problem while decoding the DICOM stream).

Source	Reason/Diagnosis	Behavior when received	Sent when
	1 - unrecognized-PDU	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).	An unrecognized PDU type is received ⁴ .
	2 - unexpected-PDU	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).	The received PDU type is not expected in the current state of connection ⁵ .
	4 - unrecognized-PDU-parameter	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON_unrecognized_pdu_parameter).	An unrecognized Associate PDU item is received ¹ .
	5 - unexpected-PDU-parameter	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON_unexpected_pdu_parameter).	<ul style="list-style-type: none"> • One of the Associate PDU items is received more than once². • One of the Associate PDU items is received unexpectedly².
	6 - invalid-PDU-parameter-value	When received, the QLAB AETerminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON_invalid_pdu_parameter).	<ul style="list-style-type: none"> • One of the Associate PDU items is received more than once³. • One of the Associate PDU items is not received³. • There is mismatch in the application context names between the SCU and the SCP. • Illegal Asynchronous Operations Window invoke value is received. • Illegal Asynchronous Operations Window perform value is received. • Unknown presentation context id is received. • Unknown abstract syntax is received. • The length or the format of a received PDU item is invalid.

Notes:

1. Associate PDU items that are recognized:

- 0x10 APPLICATION CONTEXT
- 0x20 PRESENTATION CONTEXT (RQ)
- 0x21 PRESENTATION CONTEXT (AC)
- 0x30 ABSTRACT SYNTAX
- 0x40 TRANSFER SYNTAX
- 0x50 USER INFO
- 0x51 MAXIMUM LENGTH
- 0x52 IMPLEMENTATION CLASS UID
- 0x53 ASYNCHRONOUS OPERATIONS WINDOW
- 0x54 SCP/SCU ROLE SELECTION
- 0x55 IMPLEMENTATION VERSION NAME
- 0x56 SOP CLASS EXTENDED NEGOTIATION

2. Associate PDU items for Unexpected-PDU parameterReceived more than once:

- 0x10 APPLICATION CONTEXT (SCU, SCP)

- 0x30 ABSTRACT SYNTAX (SCU, SCP)

- 0x40 TRANSFER SYNTAX (SCU)

Received unexpectedly:

- 0x20 PRESENTATION CONTEXT (RQ) (SCU)

3. Associate PDU items for Invalid-PDU parameter value:

Received more than once (SCU, SCP):

- 0x50 USER INFO

- 0x51 MAXIMUM LENGTH

- 0x52 IMPLEMENTATION CLASS UID

- 0x53 ASYNCHRONOUS OPERATIONS WINDOW

- 0x55 IMPLEMENTATION VERSION NAME

Received illegally:

- 0x21 PRESENTATION CONTEXT (AC) (SCP)

PDU items not received:

- 0x10 APPLICATION CONTEXT (SCU, SCP)

- 0x20 PRESENTATION CONTEXT (RQ) (SCP)

- 0x21 PRESENTATION CONTEXT (AC) (SCU)

- 0x50 USER INFO (SCU, SCP)

- 0x30 ABSTRACT SYNTAX (SCU)

- 0x40 TRANSFER SYNTAX (SCU)

- 0x51 MAXIMUM LENGTH (SCU, SCP)

- 0x52 IMPLEMENTATION CLASS UID (SCU)

4. PDU types that are recognized:

- 0x01 A-ASSOCIATE-RQ

- 0x02 A-ASSOCIATE-AC

- 0x03 A-ASSOCIATE-RJ

- 0x04 P-DATA-TF

- 0x05 A-RELEASE-RQ

- 0x06 A-RELEASE-RP

- 0x07 A-ABORT

5. Expected PDU's for following states:

STATE_IDLE:

- 0x01 A-ASSOCIATE-RQ

- 0x02 A-ASSOCIATE-AC

- 0x03 A-ASSOCIATE-RJ

- 0x05 A-RELEASE-RQ

- 0x06 A-RELEASE-RP

STATE_ASSOCIATED:

- 0x01 A-ASSOCIATE-RQ

- 0x02 A-ASSOCIATE-AC

- 0x03 A-ASSOCIATE-RJ

- 0x06 A-RELEASE-RP

STATE_ASSOCIATING (SCU):

- 0x01 A-ASSOCIATE-RQ

- 0x04 P-DATA-TF

- 0x05 A-RELEASE-RQ

- 0x06 A-RELEASE-RP

STATE_RELEASING:

- 0x01 A-ASSOCIATE-RQ
 - 0x02 A-ASSOCIATE-AC
 - 0x03 A-ASSOCIATE-RJ
- STATE_WAIT_FOR_ASSOCIATE (SCP):
- 0x02 A-ASSOCIATE-AC
 - 0x03 A-ASSOCIATE-RJ
 - 0x04 P-DATA-TF
 - 0x05 A-RELEASE-RQ
 - 0x06 A-RELEASE-RP
 - 0x07 A-ABORT
- STATE_WAIT_FOR_FINISH:
- 0x01 A-ASSOCIATE-RQ
 - 0x02 A-ASSOCIATE-AC
 - 0x03 A-ASSOCIATE-RJ
 - 0x04 P-DATA-TF
 - 0x05 A-RELEASE-RQ
 - 0x06 A-RELEASE-RP
- STATE_WAIT_FOR_DISCONNECT:
- 0x01 A-ASSOCIATE-RQ
 - 0x02 A-ASSOCIATE-AC
 - 0x03 A-ASSOCIATE-RJ
- STATE_TIMED_OUT:
- 0x01 A-ASSOCIATE-RQ
 - 0x02 A-ASSOCIATE-AC
 - 0x03 A-ASSOCIATE-RJ
 - 0x04 P-DATA-TF
 - 0x05 A-RELEASE-RQ
 - 0x06 A-RELEASE-RP
 - 0x07 A-ABORT

Table 14: DICOM Command Communication Failure Behavior

Source	Reason/Diagnosis	Behavior
Reply Timeout	Timeout	The Association is aborted using A-ABORT and command marked as failed. The reason is logged and reported to the user.
Association aborted	Association aborted	The command is marked as failed. The reason is logged and reported to the user.

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

4.2.1.3.1.1. Description and Sequencing of Activities

The QLAB AE can initiate associations to remote systems to verify application level communication using the C-ECHO command.

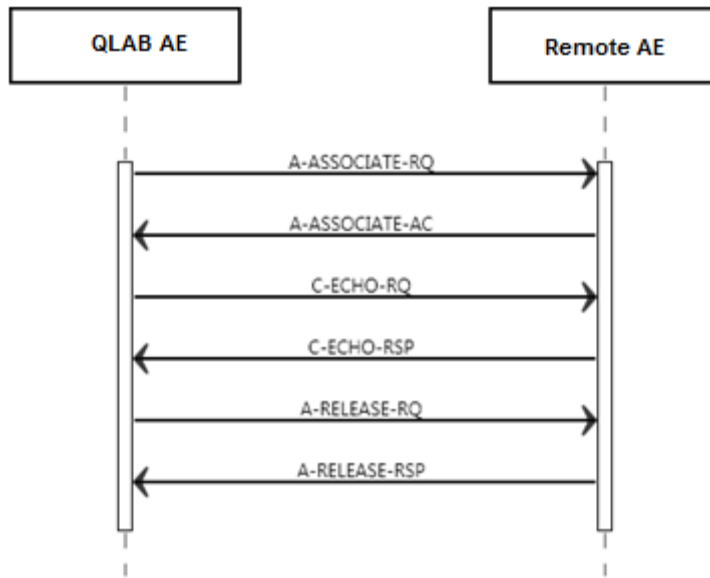


Figure 3: (Real World) Activity - Verification as SCU

The QLAB AE proposes the following presentation contexts to the remote AE during the association request before sending the C-ECHO.

Table 15: 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	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.3.1.2. SOP Specific Conformance for Verification SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

The QLAB AE provides standard conformance to the DICOM Verification service class.

4.2.1.3.1.2.1. Dataset Specific Conformance for Verification C-ECHO SCU

Details regarding the Dataset Specific response behavior will be reported in this section.

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

Table 16: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Verification is complete	The QLAB 13.0 has successfully received the verification request response.

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

Service Status	Behavior
Timeout	The Association is aborted using A-ABORT and the command is marked as failed. The reason is logged. After a maximum number of retries the user is notified via pop-up (in preview mode only).
Association aborted	The command is marked as failed. The reason is logged. After a maximum number of retries the user is notified via pop-up (in preview mode only).
Failed to connect	Log entry. After a maximum number of retries the user is notified via pop-up (in preview mode only).

4.2.1.3.2. (Real-World) Activity – Image Export

4.2.1.3.2.1. Description and Sequencing of Activities

The QLAB 13.0 implements the Storage service class to store selected images at an archive or other storage SCP. All actual selected images are exported using one and the same association. The QLAB 13.0 waits for synchronous report till a configurable time is passed, then it will release the association

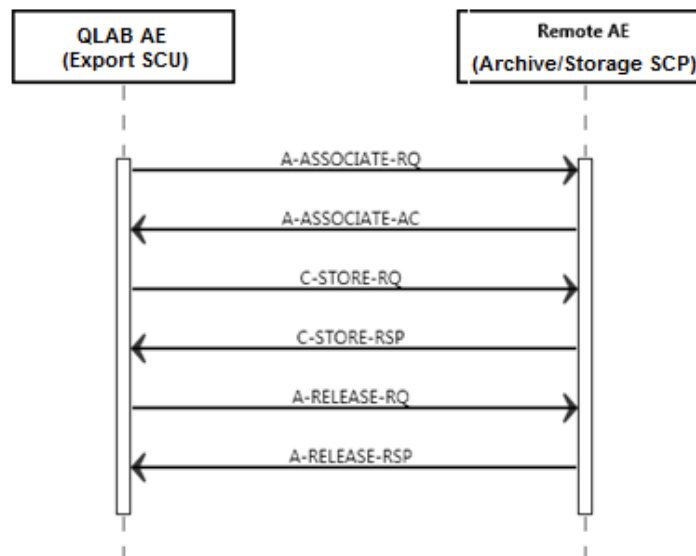


Figure 4: (Real World) Activity - Image Export

4.2.1.3.2.2. Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 17: 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		
Ultrasound Multi-frame	1.2.840.10008.5.1.	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Image Storage SOP Class	4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102		
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102				
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 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 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102		
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102		
Comprehensive SR Storage SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Private 3D Presentation State Storage SOP Class	1.3.46.670589.2.5.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.1.3.2.3. SOP Specific Conformance for Storage SOP Classes

Following remarks hold for the standard DICOM SOP Classes:

- The QLAB 13.0 supports the following Photometric Interpretations for non-compressed images:

- MONOCHROME1,
- MONOCHROME2,
- PALETTE COLOR,
- RGB, YBR_FULL,
- YBR_FULL_422,
- YBR_PARTIAL_422,
- YBR_ICT,
- YBR_RCT.

- The QLAB 13.0 can convert the data specific to the Transfer Syntaxes accepted during the association.

- JPEG Lossless (NH-FOP) compresses all bits denoted by the attribute DICOM_BITS_ALLOCATED. Therefore, any overlays encoded in the pixel data are also encoded and decoded.

- In case of both source (internal) and target compressed pixel data, decompression of the source pixel data and compression to the target pixel data only takes place in the following cases:

- 1) The source and target compression formats are different; or:
- 2) The source pixel data is multi-frame without a BOT.

- The BOT in compressed pixel data is filled if:

- 1) This is explicitly configured; or:
- 2) Group length attributes are configured.

4.2.1.3.2.3.1. Dataset Specific Conformance for C-STORE-RQ

Details regarding the Dataset Specific response behavior will be reported in this section.

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

Table 18: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful stored	Progress of the export job is updated and connection is retained for the next store. If the store of all the SOP instances is completed then the connection is released.
Failure	A7xx	Refused: Out of Resources	Error is logged and the export job fails. Connection is released.
	A9xx	Error: Data Set does not match SOP Class	Error is logged and the export job fails. Connection is released.
	Cxxx	Error: cannot understand	Error is logged and the export job fails. Connection is released.
Warning	B000	Coercion of Data Elements	Warning is logged and the export job continues.
	B007	Data Set does not match SOP Class	Warning is logged and the export job continues.
	B006	Elements Discarded	Warning is logged and the export job continues.

4.2.1.3.3. (Real-World) Activity - Find as SCU

4.2.1.3.3.1. Description and Sequencing of Activities

The operator on QLAB 13.0 can query a remote database by selecting the “Remote Data” location from the data panel. A query form will appear with all available query matching keys that can be used to filter the request to the remote system. When the operator clicks on the “OK” button in the Query form, a C-FIND-RQ message is sent to the remote system. Once the C-Find request is processed successfully from the remote node a C-Find RSP is received.

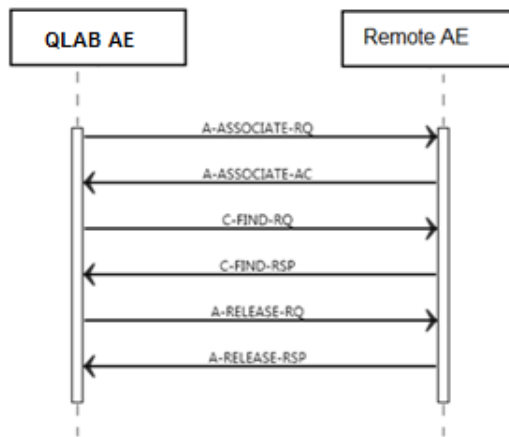


Figure 5 Data Flow Diagram – FIND as SCU

4.2.1.3.3.2. Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 19: 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 QR Information Model - FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

4.2.1.3.3.3. SOP Specific Conformance for Study Root QR Information Model - FIND SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.1.3.3.3.1. Dataset Specific Conformance for Study Root QR Information Model - FIND SOP Class C-FIND-SCU

Details regarding the Dataset Specific response behavior will be reported in this section.

Table 20: Supported Query Keys for Study Root Information Model

Study Root Information Model				
Attribute Name	Tag	VR	Type Of Matching	Comment
Query/Retrieve Level	0008,0052	CS	Single Value	Study level, Series level, Image level is supported
Study level				
Study Date	0008,0020	DA	Single Value, Range, Universal	

Study Time	0008,0030	TM	Universal	
Accession Number	0008,0050	SH	Single Value, Universal, Wildcard	
Modalities in Study	0008,0060	CS	Single Value, Universal	
Patient Name	0010,0010	PN	Single Value, Universal, Wildcard	
Patient ID	0010,0020	LO	Single Value, Universal, Wildcard	
Referring Physician's Name	0008,0090	PN	Single Value, Universal, Wildcard	
Study Instance UID	0020,000D	UI	Universal	
Study ID	0020,0010	SH	Single Value, Universal, Wildcard	
Series level				
Modality	0008,0060	CS	Single Value, Universal	
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI	Universal	
Series Number	0020,0011	PN	Universal	
Image level				
SOP Class UID	0008,0016	UI	Universal	
SOP Instance UID	0008,0018	UI	Universal	
Study Instance UID	0020,000D	UI	Single Value	
Series Instance UID	0020,000E	UI	Single Value	
Instance Number	0020,0013	IS	Universal	

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

Table 21: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Matching is complete – No final identifier is supplied	Successful completion of the query.
Failure	A700	Refused – Out of resources	Not enough resources; exception during evaluation of query.
	C000	Failed – Unable to process	Any other exception generated while evaluating the query.
Cancel	FE00	Matching terminated due to Cancel request	Query is cancelled.
Pending	FF00	Matches are continuing – Current match is supplied and any optional keys were supported in the same manner as required keys	Optional keys supported.
	FF01	Matches are continuing – Warning that one or more optional keys were not supported for existence and/or matching for this identifier	Optional keys not supported.

4.2.1.3.4. (Real-World) Activity - Move as SCU

4.2.1.3.4.1. Description and Sequencing of Activities

The Move activity as SCU (Move Remote Images) involves the retrieval of images on a remote system by moving matching studies/series from the remote database to the local database or to another remote database.

QLAB AE initiates an association for each C-MOVE request to the selected remote DICOM node and define the move destination in C-MOVE request. The Remote AE will transfer the studies/series to the move destination and send the Retrieve (C-MOVE) response to QLAB AE. For successful operation, both client and sever must be configured to make a Retrieve (C-MOVE) possible.

The association is released after the final Retrieve (C-MOVE) response for the related request has been received (no more pending).

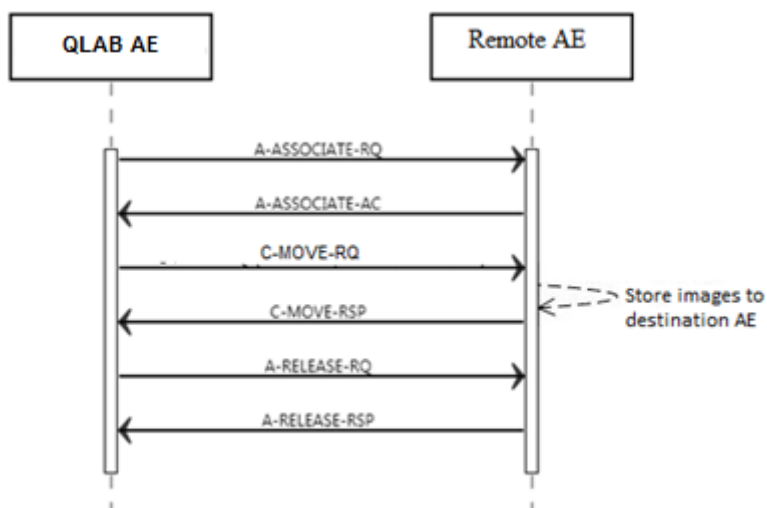


Figure 6 Data Flow Diagram – MOVE as SCU

4.2.1.3.4.2. Proposed Presentation Contexts

The presentation contexts are defined in the next table.

Table 22: 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 QR Information Model - MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

QLAB AE does not support extended negotiations.

4.2.1.3.4.3. SOP Specific Conformance for Study Root QR Information Model - MOVE SOP Class

From the query responses received from a remote database, the QLAB user can select:

- A single study
- Multiple studies
- A single series
- Multiple series

Via the “copy” to local database action on QLAB 13.0 a C-MOVE-RQ message on study or series level will be sent to the remote system. QLAB supports both the study level and series level request operation. (patient level and image level move is not supported) In case multiple studies are selected for retrieve, for each study a separate job (=association) is created with 1 C-MOVE-RQ. For multiple series retrieve, 1 job (association) is created with a C-MOVE-RQ for each requested series.

The QLAB 13.0 user may cancel the C-MOVE service by selecting a cancel button to trigger a C-MOVE-CANCEL request at any time during the processing of the C-MOVE.

4.2.1.3.4.3.1. Dataset Specific Conformance for Study Root QR Information Model - MOVE SOP Class C-MOVE-SCU

Details regarding the Dataset Specific response behavior will be reported in this section.

Table 23: Identifiers for MOVE Study Root Information Model as SCU

Study Root Information Model			
Attribute Name	Tag	VR	Comment
Query/Retrieve Level	0008,0052	CS	Applied value: STUDY, SERIES
Study level			
Study Instance UID	0020,000D	UI	
Series level			
Study Instance UID	0020,000D	UI	
Series Instance UID	0020,000E	UI	

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

Table 24: Status Response for C-MOVE Study Root Information Model

Service Status	Error Code	Further Meaning	Behavior
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 and reported to the user.
	A702	Out of Resources – Unable to perform sub-operations	The move job is marked as failed. The association is released. The reason is logged and reported to the user.
	A801	Move destination unknown	The move job is marked as failed. The association is released. The reason is logged and reported to the user.
Failed	A900	Identifier does not match SOP class	The move job is marked as failed. The association is released. The reason is logged and reported to the user.
	Cxxx	Unable to process	The move job is marked as failed. The association is released. The reason is logged and reported to the user.
Cancel	FE00	Sub-operations terminated due to Cancel Indication	The move job is marked as cancelled. The association is released. The reason is logged and reported to the user.
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.

4.2.1.4. Association Acceptance Policy

The QLAB AE accepts associations for the following purposes:

- To allow remote applications to verify application level communication.
- To allow remote applications to store images in the QLAB database.

The QLAB AE rejects association requests from unknown applications, i.e. applications that offer an unknown "calling AE title". An application is known if and only if it is defined per configuration of the QLAB 13.0 system. The QLAB AE also rejects association requests from applications that do not address the QLAB AE, i.e. that offer a wrong "called AE title". The QLAB AE title is defined during configuration of QLAB 13.0.

The Application Entity may reject Association attempts as shown in the table below.

Table 25: Association Reject Reasons

Result	Source	Reason/Diagnosis	Behavior	
1 - rejected permanent	1 - DICOM UL service-user	1 - no-reason-given	Association is not established due to any problem other than that specified for QLAB SCP in the rows below. (Example: Problem while decoding the DICOM stream).	
		2 - application-context-name-not-supported	An application context name other than 1.2.840.10008.3.1.1.1 is requested by the SCU during association.	
		3 - calling-AE-title-not-recognized	The configuration does not contain a repository having the Calling AE Title as per the association request; There is a problem in configuration (related to composing the configuration from the SCU and the SCP configuration).	
		7 - called-AE-title-not-recognized	The called AE Title in the association request does not match the AE Title as per the configuration.	
	2 - DICOM UL service provider (ACSE related function)	1 - no-reason-given	Not used.	
		2 - protocol-version-not-supported	Not used.	
	3 - DICOM UL service provider (Presentation related function)	1 - temporary-congestion	Not used.	
		2 - local-limit-exceeded	Not used.	
	2 - rejected-transient	1 - DICOM UL service-user	1 - no-reason-given	Not used.
			2 - application-context-name-not-supported	Not used.
3 - calling-AE-title-not-recognized			Not used.	
7 - called-AE-title-not-recognized			Not used.	
2 - DICOM UL service provider (ACSE related function)		1 - no-reason-given	Maximum number of associations is exceeded and an association request is received.	
		2 - protocol-version-not-supported	Not used.	
3 - DICOM UL service provider (Presentation related function)		1 - temporary-congestion	Not used.	
		2 - local-limit-exceeded	Not used.	

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

Table 26: Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 - DICOM UL service-user (initiated abort)	0 - reason-not-specified	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (0: ABORT_SOURCE_dul_user, 0: ABORT_REASON_not_specified).
2 - DICOM UL service-provider (initiated abort)	0 - reason-not-specified	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 0: ABORT_REASON_not_specified)

Source	Reason/Diagnosis	Behavior
	1 - unrecognized-PDU	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 1: ABORT_REASON_unrecognized_pdu).
	2 - unexpected-PDU	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 2: ABORT_REASON_unexpected_pdu).
	4 - unrecognized-PDU parameter	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 4: ABORT_REASON_unrecognized_pdu_parameter).
	5 - unexpected-PDU parameter	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 5: ABORT_REASON_unexpected_pdu_parameter).
	6 - invalid-PDU-parameter value	When received, the QLAB AE terminates the connection with the following log: Association ABORTED by peer (2: ABORT_SOURCE_dul_provider, 6: ABORT_REASON_invalid_pdu_parameter).

Notes:

1. Associate PDU items that are recognized:

- 0x10 APPLICATION CONTEXT
- 0x20 PRESENTATION CONTEXT (RQ)
- 0x21 PRESENTATION CONTEXT (AC)
- 0x30 ABSTRACT SYNTAX
- 0x40 TRANSFER SYNTAX
- 0x50 USER INFO
- 0x51 MAXIMUM LENGTH
- 0x52 IMPLEMENTATION CLASS UID
- 0x53 ASYNCHRONOUS OPERATIONS WINDOW
- 0x54 SCP/SCU ROLE SELECTION
- 0x55 IMPLEMENTATION VERSION NAME
- 0x56 SOP CLASS EXTENDED NEGOTIATION

2. Associate PDU items for Unexpected-PDU parameter Received more than once:

- 0x10 APPLICATION CONTEXT (SCU, SCP)
- 0x30 ABSTRACT SYNTAX (SCU, SCP)
- 0x40 TRANSFER SYNTAX (SCU)

Received unexpectedly:

- 0x20 PRESENTATION CONTEXT (RQ) (SCU)

3. Associate PDU items for Invalid-PDU parameter value:

Received more than once (SCU, SCP):

- 0x50 USER INFO
- 0x51 MAXIMUM LENGTH
- 0x52 IMPLEMENTATION CLASS UID
- 0x53 ASYNCHRONOUS OPERATIONS WINDOW
- 0x55 IMPLEMENTATION VERSION NAME

Received illegally:

- 0x21 PRESENTATION CONTEXT (AC) (SCP)

PDU items not received:

- 0x10 APPLICATION CONTEXT (SCU, SCP)

- 0x20 PRESENTATION CONTEXT (RQ) (SCP)
- 0x21 PRESENTATION CONTEXT (AC) (SCU)
- 0x50 USER INFO (SCU, SCP)
- 0x30 ABSTRACT SYNTAX (SCU)
- 0x40 TRANSFER SYNTAX (SCU)
- 0x51 MAXIMUM LENGTH (SCU, SCP)
- 0x52 IMPLEMENTATION CLASS UID (SCU)

4. PDU types that are recognized:

- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

5. Expected PDU's for following states:

STATE_IDLE:

- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_ASSOCIATED:

- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x06 A-RELEASE-RP

STATE_ASSOCIATING (SCU):

- 0x01 A-ASSOCIATE-RQ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP

STATE_RELEASING:

- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ

STATE_WAIT_FOR_ASSOCIATE (SCP):

- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

STATE_WAIT_FOR_FINISH:

- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ

- 0x06 A-RELEASE-RP
- STATE_WAIT_FOR_DISCONNECT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- STATE_TIMED_OUT:
- 0x01 A-ASSOCIATE-RQ
- 0x02 A-ASSOCIATE-AC
- 0x03 A-ASSOCIATE-RJ
- 0x04 P-DATA-TF
- 0x05 A-RELEASE-RQ
- 0x06 A-RELEASE-RP
- 0x07 A-ABORT

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

4.2.1.4.1.1. Description and Sequencing of Activities

The QLAB 13.0 accept Associations from configured systems that wish to verify application level communication using the C-ECHO command.

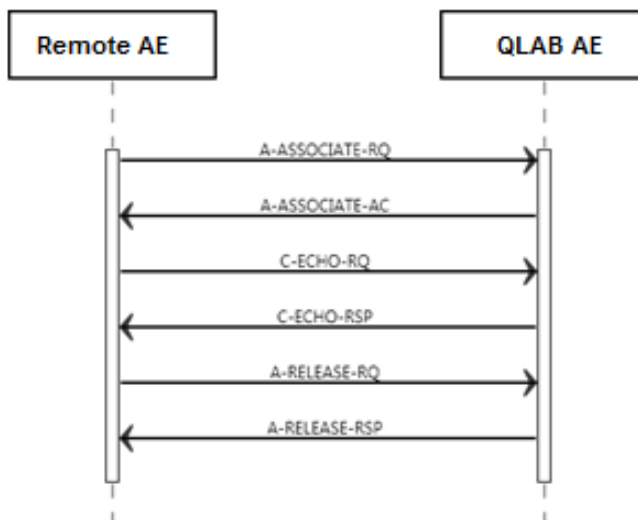


Figure 7: (Real World) Activity - Verification as SCP

4.2.1.4.1.2. Accepted Presentation Contexts

The presentation contexts are defined in the next table.

Table 27: 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	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.4.1.3. SOP Specific Conformance for Verification SOP Class

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

4.2.1.4.1.3.1. Dataset Specific Conformance for Verification C-ECHO SCP

Details regarding the Dataset Specific response behavior will be reported in this section.

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

Table 28: Status Response

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Confirmation	Confirm the verification request.

4.2.1.4.2. (Real-World) Activity – Image Import

4.2.1.4.2.1. Description and Sequencing of Activities

The QLAB 13.0 accept associations from configured systems that wish to store images in its database using the C-STORE command.

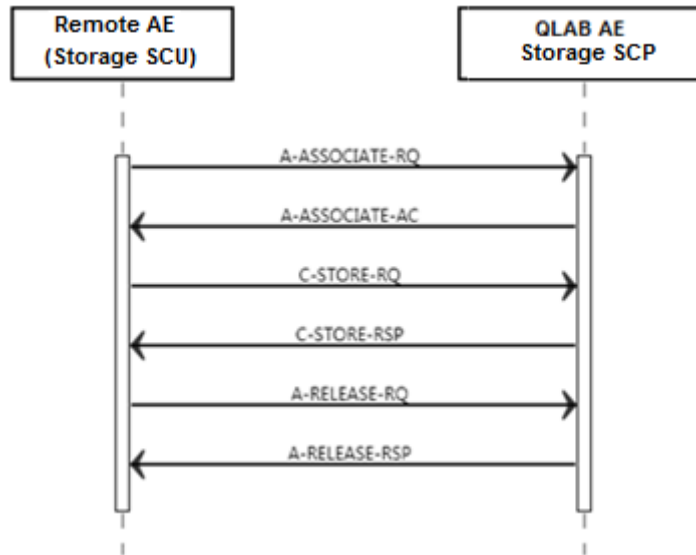


Figure 8: Data Flow Diagram – Store Image – Storage as SCP

4.2.1.4.2.2. Accepted Presentation Contexts

The presentation contexts are defined in the next table.

Table 29: 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		
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102				
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102				
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102		
Multi-frame True Color Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		RLE Lossless	1.2.840.10008.1.2.5		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended Process 2 And 4	1.2.840.10008.1.2.4.51		
		JPEG Lossless Non Hierarchical 14 (Retired)	1.2.840.10008.1.2.4.57		
		JPEG Lossless Non Hierarchical 15 (Retired)	1.2.840.10008.1.2.4.58		
		JPEG Lossless Hierarchical 28 (Retired)	1.2.840.10008.1.2.4.65		
		JPEG Lossless Hierarchical 29 (Retired)	1.2.840.10008.1.2.4.66		
		JPEG LS Lossless Image Compression	1.2.840.10008.1.2.4.80		
		JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91		
		JPEG 2000 Image Compression Lossless Only	1.2.840.10008.1.2.4.90		
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)	1.2.840.10008.1.2.4.70		
		Philips CT Private-ELE (Private)	1.3.46.670589.33.1.4.1		
Comprehensive SR Storage SOP Class	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Private 3D Presentation State Storage SOP Class	1.3.46.670589.2.5.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Note: ILE is preferred transfer syntax.

The QLAB 13.0 accept all contexts in the intersection of the proposed and acceptable Presentation Contexts. This means that multiple proposed presentation contexts with the same SOP class but different transfer syntaxes are accepted by the QLAB 13.0 as far as those transfer syntaxes are part of the acceptable transfer syntaxes. There is no check for duplicate contexts and these are therefore accepted.

4.2.1.4.2.3. SOP Specific Conformance for Storage SOP Classes

This section and sub-section include the manufacturer SOP and Dataset specific information as well the status codes and their corresponding behavior.

Remarks:

- Pixel data will be stored in configurable transfer syntax. This implies that transfer syntax conversions might take place during import. Compressed pixel data is always decompressed and afterwards converted to the "configurable transfer syntax".
- A non-empty BOT may be present in imported JPEG encoded pixel data.
- Value Representation 'UN' (Unknown) is supported, and shall be used for any attributes not known to QLAB AE and received per implicit transfer (ILE).
- Images must contain the minimum set of attributes prescribed by DICOM. Otherwise the default behavior is that the image is rejected and the association aborted.

4.2.1.4.2.3.1. Dataset Specific Conformance for C-STORE-RSP

Details regarding the Dataset Specific response behavior will be reported in this section.

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

Table 30: Status Response C-STORE

Service Status	Error Code	Further Meaning	Behavior
Success	0000	Successful command	Successful completion of the store request.
Failure	A700	Refused: out of resources	Not enough resources available to do a store.
	A900	Error: Data Set Does Not Match SOP Class	Data Set Does Not Match SOP Class
	C000	Error: cannot understand	Any other exception generated during the store.

4.3. Network Interfaces

4.3.1. Physical Network Interfaces

The System provides only DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the standard. TCP/IP is the only protocol stack supported.

Supported physical medium include:

IEEE 802.3-1995, 10BASE-T

IEEE 802.3-1995, 100BASE-TX (Fast Ethernet)

IEEE 802.3, 10/100/1000Mb/s Ethernet.

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.

4.3.2. Additional Protocols

No additional protocols are used.

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

4.4.1.1. Local AE Titles

The FieldService User Interface only allows one AE to be configured.

The following AE specific information must be available to configure a local AE:

- AE title.
- Hostname or IP address (or both). Use "localhost" (127.0.0.1) for the complete local system. If the AE should only be associated with a specific network adapter, don't specify the host name and use the IP address of this network adapter.
- Port number

4.4.1.2. Remote AE Title/Presentation Address Mapping

One or more remote AE's may be configured.

The following AE specific information must be available to configure a remote AE:

- AE title.
- Hostname or IP address (or both).
- Port number.

4.4.2. Parameters

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

Table 31: Configuration Parameters Table

Parameter	Configurable	Default Value
General Parameter		
Time-out waiting for acceptance or rejection Response to an Association Open Request (Application Level timeout)	Yes	60 [s] (set 0 for no time-out)
General Dimse level time-out values (Verification, Storage, Storage Commitment)	No	-
Time-out for response to TCP/IP connect request. (Low-level timeout)	OS	-
Time-out waiting for acceptance of a TCP/IP message over the network (Low-level timeout)	OS	-
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	OS	-
Any changes to default TCP/IP settings, such as configurable stack parameters.	OS	-
Local AE Specific Parameters		
Size constraint in maximum object size	No	-
Maximum PDU size the AE can send and receive	No	0
Association time-out SCP	No	30 [s]
Association time-out SCU	No	30 [s]
AE specific DIMSE level time-out values	No	300 [s] (set 0 for no time-out)
Number of simultaneous associations by service and/or SOP class	No	1 per service/SOP class
SOP Class support	No	All supported SOP classes
Transfer Syntax support	No	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian RLE Lossless

Parameter	Configurable	Default Value
		JPEG Baseline (Process 1)
		JPEG Extended Process 2 And 4
		JPEG Lossless Non Hierarchical 14 (Retired)
		JPEG Lossless Non Hierarchical 15 (Retired)
		JPEG Lossless Hierarchical 28 (Retired)
		JPEG Lossless Hierarchical 29 (Retired)
		JPEG LS Lossless Image Compression
		JPEG 2000 Image Compression
		JPEG 2000 Image Compression Lossless Only
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)
		Philips CT Private-ELE (Private)
		MPEG-4 AVC/H.264 High Profile / Level 4.1
Remote Configurable Parameters		
Device Type	Yes	Available values: PACS: Acts as a Service Class Provider (SCP) Ultrasound System: Acts as a Service Class User (SCU)
DICOM services supported by PACS AE	Yes	Available values: Query: Supports Study Root Query/Retrieve Information Model – FIND SOP Class as an SCP Move: Supports Study Root Query/Retrieve Information Model – MOVE SOP Class as an SCP Storage: Supports Storage SOP Classes as an SCP
Data Type supported by Archive node	Yes	Available values: Private Attributes Structured Report
Association (Artim) time-out	Yes	60
Storage Commit Max Reply Waiting Time (after time-out the reply will be handled asynchronously)	Yes	60 [s] (set 0 for no time-out, -1 for immediate time-out)
Number of simultaneous associations by service and/or SOP class	No	1 per service/SOP class
SOP Class support	No	All supported SOP classes
Transfer Syntax support	No	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian RLE Lossless JPEG Baseline (Process 1) JPEG Extended Process 2 And 4 JPEG Lossless Non Hierarchical 14 (Retired) JPEG Lossless Non Hierarchical 15 (Retired) JPEG Lossless Hierarchical 28 (Retired) JPEG Lossless Hierarchical 29 (Retired) JPEG LS Lossless Image Compression JPEG 2000 Image Compression JPEG 2000 Image Compression Lossless Only

Parameter	Configurable	Default Value
		JPEG Lossless, Non-Hierarchical, FOP (Process 14)
		Philips CT Private-ELE (Private)
		MPEG-4 AVC/H.264 High Profile / Level 4.1

5. Media Interchange

5.1. Implementation model

The implementation model identifies the DICOM Application Entities for Media in specific implementation and relates the Application Entities to Real-World Activities.

5.1.1. Application Data Flow Diagram

The QLAB 13.0 implements one media application entity: QLAB AE

Next figure shows the Media Interchange application data flow as a functional overview of the QLAB AE.

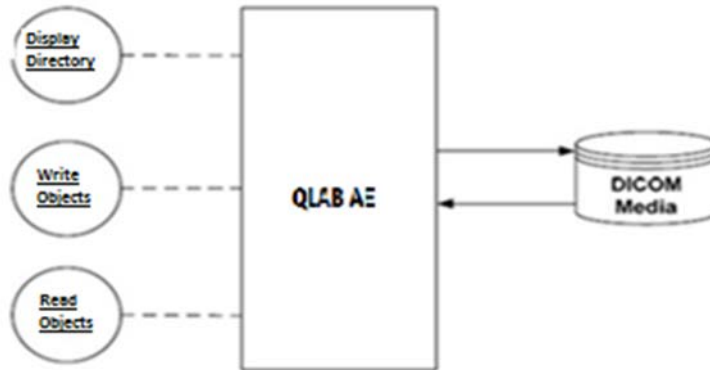


Figure 9: Media Interchange Application Data Flow Diagram

5.1.2. Functional Definitions of AE's

The QLAB 13.0 implements the following functions for DICOM media.

- Write a DICOM file-set onto the medium.
- Create/Update a DICOMDIR file.
- Read the DICOMDIR file from the medium.
- Read selected objects from the medium.

5.1.3. Sequencing of Real World Activities

Write images can be initiated by selecting a proper export destination, selecting requested images and clicking the export button.

5.2. AE Specifications

This section in the DICOM Conformance Statement specifies a set of Media Application Entities.

5.2.1. Media Storage Media – Specification

This section contains general policies that apply to all of the Application Entities described in subsequent section.

The QLAB 13.0 provides standard conformance to the DICOM interchange option of the media storage service class, and follows the specifications as defined in the DICOM standard – Media Storage and File Format for Data Interchange (PS 3.10) and Media Storage Application Profiles (PS 3.11).

For one or more Application Profiles, the following table shows the Real-World Activities and the roles of each of these Real-World Activities.

Table 32: AE Media Storage related Application Profiles, Real-World Activities and Roles

Supported Application Profile	Identifier	Real-World Activities	Roles
General Purpose USB Media Interchange with JPEG	STD-GEN-USB-JPEG	Update File-set	FSU
		Create File-set	FSC
		Read File-set	FSR

5.2.1.1. File Meta Information for the Media Storage

Table 33: Implementation Identifying Information

Property	Value
Implementation Class UID:	1.3.46.670589.54.2.17.3
Implementation Version Name:	17.3.0.0

5.2.1.2. Real World Activities

The AE specification contains a description of the Real-World Activities, which invoke the particular AE.

5.2.1.2.1. RWA - Read File-set

This Media Application Entity has a File-set Reader functionality which is described here.

Display Directory

The QLAB 13.0 will act as a FSR when reading the directory of the medium. This allows the System Integrator to see the results in an overview of the patients, studies, series and images.

The QLAB 13.0 will not access DICOM media when either:

- Patient ID is absent; or
- Study Instance UID has no value; or
- Series Instance UID has no value.

Read Images

The QLAB 13.0 will act as a FSR when reading all/selected images from DICOM media.

5.2.1.2.1.1. Media Storage Application Profile

Refer to the table in section 5.2.1.

5.2.1.2.1.1.1. Options

Not applicable.

5.2.1.2.2. RWA - Create File-set

This Media Application Entity has a File-set Creator functionality which is described here.

Write Images

The QLAB 13.0 acts as an FSC when writing DICOM objects onto DICOM media. The QLAB 13.0 can also store private attributes. Also, QLAB acts as an FSU by reading and updating the DICOM object onto DICOM media.

When the QLAB 13.0 has to write objects to DICOM media, it can encounter the following situation.

The objects were previously received via C-STORE operations. Some attributes in the received images have a zero-length value (type 2 attributes). However, the Application Profile specifies some of these attributes as type 1: they must have a value. In such cases the QLAB 13.0 supplies a value for the following attributes (if necessary):

- Patient ID;
- Study ID;
- Series Number;
- Instance number;
- Study Date;
- Study Time.

The mechanism of generating a value for Patient ID is to create a new value (i.e. Study Instance UID) for each new study written to the medium, even if this study belongs to a patient recorded earlier.

Study ID is assigned the value of the first Requested Procedure ID (0040, 1001) encountered in the Request Attributes Sequence (0040, 0275).

5.2.1.2.2.1. Media Storage Application Profile

Refer to the table in section 5.2.1.

5.2.1.2.2.1.1. Options

Not applicable.

5.2.1.2.3. RWA - Update File-set

This Media Application Entity has a File-set Updater functionality which is described here.

5.2.1.2.3.1. Media Storage Application Profile

The Application Profile that is used by this Media Application Entity is specified in this section.

5.2.1.2.3.1.1. Options

Not applicable.

5.3. Augmented and Private Application Profiles

This section is used for the description of Augmented and Private Application Profiles.

5.3.1. Augmented Application Profiles

Any Augmented Application Profiles used by the Application Entity are described in this section. The rules governing the structure of an Augmented Application Profile are also described.

5.3.1.1. Augmented Application Profile Descriptions

Each Augmented Application Profile has a section that describes the specific features of the Application Profile that make it augmented.

5.3.1.1.1. SOP Class Augmentations

Not applicable

5.3.1.1.2. Directory Augmentations

Instances of the private SOP classes may be written on the media. This requires a Directory Record Type (0004,1430) with the value "PRIVATE" and configuration of the required Private Record UID. This UID is used to define a non-standard type of Directory Record by reference to its position in a private extension to the DICOM Basic Directory IOD Information Model.

5.3.1.1.3. Other Augmentations

Not applicable.

5.3.2. Private Application Profiles

Not applicable.

5.4. Media Configuration

In the following table an overview is given of some important configuration attributes related to the DICOM behaviour of QLAB 13.0 .

Table 34: Configuration Parameters table

Parameter	Configurable	Default Value
Transfer Syntax support	No	Explicit VR Little Endian - 1.2.840.10008.1.2.1
SOP Class	No	All transfer SOP classes in QLAB 13.0

***Note:** Explicit VR Little Endian is default transfer syntax.

6. Support of Character Sets

Any support for character sets in Network and Media services is described here.

Table 35: Supported DICOM Character Sets

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Latin alphabet No. 1	ISO 2022 IR 100	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/01	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO 2022 IR 101	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/02	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO 2022 IR 109	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/03	ISO-IR 109	G1	Supplementary set of ISO 8859
Latin alphabet No. 4	ISO 2022 IR 110	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/04	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO 2022 IR 126	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/06	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO 2022 IR 127	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/07	ISO-IR 127	G1	Supplementary set of ISO 8859
Japanese	ISO 2022 IR 13	ESC 02/08 04/10	ISO-IR 14	G0	JIS X 0201: Romaji
		ESC 02/09 04/09	ISO-IR 13	G1	JIS X 0201: Katakana
Hebrew	ISO 2022 IR 138	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/08	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO 2022 IR 144	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/12	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO 2022 IR 148	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 04/13	ISO-IR 148	G1	Supplementary set of ISO 8859
Thai	ISO 2022 IR 166	ESC 02/08 04/02	ISO-IR 6	G0	ISO 646
		ESC 02/13 05/04	ISO-IR 166	G1	TIS 620-2533 (1990)
Default repertoire	ISO 2022 IR 6	-	ISO-IR 6	G0	ISO 646
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859
Latin alphabet No. 2	ISO_IR 101	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 101	G1	Supplementary set of ISO 8859
Latin alphabet No. 3	ISO_IR 109	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 109	G1	Supplementary set of ISO 8859
Latin alphabet No. 4	ISO_IR 110	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 110	G1	Supplementary set of ISO 8859
Greek	ISO_IR 126	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 126	G1	Supplementary set of ISO 8859
Arabic	ISO_IR 127	-	ISO-IR 6	G0	ISO 646

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
		-	ISO-IR 127	G1	Supplementary set of ISO 8859
Japanese	ISO_IR 13	-	ISO-IR 14	G0	JIS X 0201: Romaji
		-	ISO-IR 13	G1	JIS X 0201: Katakana
		-	ISO-IR 13	G1	JIS X 0201: Katakana
Hebrew	ISO_IR 138	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 138	G1	Supplementary set of ISO 8859
Cyrillic	ISO_IR 144	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 144	G1	Supplementary set of ISO 8859
Latin alphabet No. 5	ISO_IR 148	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 148	G1	Supplementary set of ISO 8859
Thai	ISO_IR 166	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 166	G1	TIS 620-2533 (1990)

As can be seen in the table above, QLAB 13.0 supports all character sets currently defined by DICOM except for the multi-byte character sets without code extensions.

Unsupported characters shall be displayed as “?”.

7. Security

7.1. Security Profiles

The QLAB 13.0 does not fully support DICOM security profiles. However, it does support security measures that will be used for secure authentication of a node and for the generation of audit records. The supported components for security measures by QLAB 13.0 are:

- Audit Trail Component
- TLS Component

7.1.1. Audit Trail Component

The Audit Trail Component of QLAB 13.0 allows security officers in an institution to audit activities, to detect non-compliant behavior in the enterprise, and to facilitate detection of improper creation, access, modification and deletion of Protected Health Information (PHI), where PHI data is considered as information records (Registration, Order, Study/Procedure, Reports and to a lesser degree Images), and not the flow of information between the systems.

The messages are created and sent to a syslog server according to the syslog protocol. The time that is used will be the local time of the system. The syslog server is an element of the Hospital infrastructure. The following messages will be created and sent to a central Audit Record Repository,

- Application Activity (when QLAB starts or shuts down).
- DICOM Study Deleted (If SOP Instances are deleted from a specific study. One event covers all instances deleted for the particular study).
- User Authentication (when the user logs in or logs out).
- Begin Transferring DICOM Instances (when an examination is being transferred from the QLAB to a remote network node).
- DICOM Instances Transferred (when an examination is transferred from the QLAB to a remote network node).
- Query (when query is triggered from QLAB)
- DICOM Instances Accessed (Study is created, modified, accessed, or deleted).
- Export (export on media e.g USB).

7.2. Association Level Security

QLAB 13.0 accepts associations only from known applications or an application whose “calling AE Title” is defined in its configuration file. QLAB 13.0 will reject association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application entity (AE) is known if – and only if – it is defined during configuration of QLAB 13.0, which is done via the configuration application.

7.3. Application Level Security

If configured QLAB 13.0 supports security measures for:

- generation of audit trail records;
- access control and user authentication.

7.4. Attribute Confidentiality Profiles

QLAB13.0 conforms to the Basic Application Level Confidentiality Profile as a de-identifier. This functionality is targeted towards creating a special purpose, de-identified version of an already existing Data set.

Table presents all attributes that can be de-identified by the QLAB13.0. Each Attribute to be protected has its value replaced by no value or some auto generated which does not allow identification of the patient.

Table 36: De-identified Attributes

Attribute Name	Tag	Replacement Value
Instance Creator UID	0008,0014	No values
Accession Number	0008,0050	No values
Institution Name	0008,0080	No values
Institution Address	0008,0081	No values
Referring Physicians Name	0008,0090	No values
Referring Physician Address	0008,0092	No values
Referring Physician Telephone Numbers	0008,0094	No values
Station Name	0008,1010	No values
Study Description	0008,1030	No values
Series Description	0008,103E	No values
Institutional Department Name	0008,1040	No values
Physicians Of Record	0008,1048	No values
Performing Physician Name	0008,1050	No values
Name Of Physicians Reading Study	0008,1060	No values
Operators Name	0008,1070	No values
Admitting Diagnoses Description	0008,1080	No values
Derivation Description	0008,2111	No values
Patient Name	0010,0010	Value configurable by user.
Patient Birth Date	0010,0030	No values
Patient Birth Time	0010,0032	No values
Patient Sex	0010,0040	No values
Other Patient Ids	0010,1000	No values
Other Patient Names	0010,1001	No values
Patients Age	0010,1010	No values
Patients Size	0010,1020	No values
Patients Weight	0010,1030	No values
Medical Record Locator	0010,1090	No values
Ethnic Group	0010,2160	No values
Occupation	0010,2180	No values
Additional Patient History	0010,21B0	No values
Patient Comments	0010,4000	No values
Device Serial Number	0018,1000	No values
Protocol Name	0018,1030	No values
Study ID	0020,0010	No values
Frame Of Reference UID	0020,0052	New Unique Random value
Synchronization Frame Of Reference UID	0020,0200	New Unique Random value
Image Comments	0020,4000	No values
Request Attributes Sequence	0040,0275	No values
Storage Media File Set ID	0088,0130	No values

Attribute Name	Tag	Replacement Value
Patient ID	0010,0020	New Unique Random value
Study Instance UID	0020,000D	New Unique Random value
Series Instance UID	0020,000E	New Unique Random value
Patient Address	0010,1040	No values
Patient Telephone Numbers	0010,2154	No values

8. QLAB

8.1. IOD Contents

8.1.1. Created SOP Instances

This section specifies each IOD created by this application.

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

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 37: List of created SOP Classes

SOP Class Name	SOP Class UID
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1
Comprehensive SR Storage SOP Class	1.2.840.10008.5.1.4.1.1.88.33
Private 3D Presentation State Storage SOP class	1.3.46.670589.2.5.1.1

8.1.1.2. Ultrasound Image Storage SOP Class

Table 38: IOD of Created Ultrasound Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS

Study	General Study Module	ALWAYS
	Patient Study Module	CONDITIONAL
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	CONDITIONAL
	General Reference Module	CONDITIONAL
	Image Pixel Module	ALWAYS
	US Image Module	ALWAYS
	VOI LUT Module	CONDITIONAL
	SOP Common Module	ALWAYS

Table 39: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Copied from source image
Patient ID	0010,0020	LO		VNAP	COPY	Copied from source image
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from source image
Patient's Sex	0010,0040	CS	F, M, O	VNAP	COPY	Copied from source image

Table 40: General Study Module

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

Table 41: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ALWAYS	AUTO	-
Series Time	0008,0031	TM		ALWAYS	AUTO	-
Modality	0008,0060	CS	US	ALWAYS	AUTO	-
Series Description	0008,103E	LO		ALWAYS	AUTO	-
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	-
Series Number	0020,0011	IS		ALWAYS	AUTO	-

Table 42: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	AUTO	-
Manufacturer's Model Name	0008,1090	LO	QLAB	ALWAYS	AUTO	-
Software Versions	0018,1020	LO	QLAB 13.0	ALWAYS	AUTO	-

Table 43: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY	ALWAYS	AUTO	-
Content Date	0008,0023	DA		ALWAYS	AUTO	-
Content Time	0008,0033	TM		ALWAYS	AUTO	-
Derivation Description	0008,2111	ST		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-
Patient Orientation	0020,0020	CS		ALWAYS	AUTO	-
Burned In Annotation	0028,0301	CS		ALWAYS	AUTO	-
Lossy Image Compression	0028,2110	CS	00 or 01	ANAP	AUTO	-
Lossy Image Compression Ratio	0028,2112	DS		ANAP	AUTO	-

Table 44: General Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Derivation Description	0008,2111	ST		ALWAYS	AUTO	-
Source Image Sequence	0008,2112	SQ		ALWAYS	AUTO	-
>Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	-
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	-

Table 45: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US		ALWAYS	AUTO	-
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO	-
Planar Configuration	0028,0006	US		ALWAYS	AUTO	-
Rows	0028,0010	US		ALWAYS	AUTO	-
Columns	0028,0011	US		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	-

Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	-
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Table 46: US Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED/SECONDARY	ALWAYS	AUTO	-
Samples per Pixel	0028,0002	US		ALWAYS	AUTO	-
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO	-
Planar Configuration	0028,0006	US		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	0x0000	ALWAYS	AUTO	-
Lossy Image Compression	0028,2110	CS	00 or 01	ALWAYS	AUTO	-

Table 47: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS	128	ALWAYS	AUTO	-
Window Width	0028,1041	DS	256	ALWAYS	AUTO	-

Table 48: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.6.1	ALWAYS	AUTO	-
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	-

8.1.1.3. Ultrasound Multi-frame Image Storage SOP Class

Table 49: IOD of Created Ultrasound Multi-frame Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
	Patient Study Module	CONDITIONAL
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	General Image Module	CONDITIONAL
	Image Pixel Module	CONDITIONAL
	Cine Module	CONDITIONAL

Multi-Frame Module	CONDITIONAL
US Image Module	CONDITIONAL
SOP Common Module	ALWAYS
General Reference Module	CONDITIONAL

Table 50: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Copied from source image
Patient ID	0010,0020	LO		VNAP	COPY	Copied from source image
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from source image
Patient's Sex	0010,0040	CS	F, M, O	VNAP	COPY	Copied from source image
Patient Comments	0010,4000	LT		ANAP	COPY	Copied from source image

Table 51: General Study Module

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

Table 52: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ALWAYS	AUTO	-
Series Time	0008,0031	TM		ALWAYS	AUTO	-
Modality	0008,0060	CS	US	ALWAYS	AUTO	-
Series Description	0008,103E	LO		ALWAYS	AUTO	-
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	-
Series Number	0020,0011	IS		ALWAYS	AUTO	-

Table 53: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	AUTO	-
Manufacturer's Model Name	0008,1090	LO	QLAB	ALWAYS	AUTO	-
Software Versions	0018,1020	LO	QLAB 13.0	ALWAYS	AUTO	-

Table 54: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY	ALWAYS	AUTO	-
Content Date	0008,0023	DA		ALWAYS	AUTO	-
Content Time	0008,0033	TM		ALWAYS	AUTO	-
Derivation Description	0008,2111	ST		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-
Patient Orientation	0020,0020	CS		ALWAYS	AUTO	-
Burned In Annotation	0028,0301	CS		ALWAYS	AUTO	-
Lossy Image Compression	0028,2110	CS	00 or 01	ANAP	AUTO	-
Lossy Image Compression Ratio	0028,2112	DS		ANAP	AUTO	-

Table 55: 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	-
Samples per Pixel	0028,0002	US		ALWAYS	AUTO	-
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO	-
Planar Configuration	0028,0006	US		ALWAYS	AUTO	-
Pixel Representation	0028,0103	US		ALWAYS	AUTO	-
High Bit	0028,0102	US		ALWAYS	AUTO	-
Bits Stored	0028,0101	US		ALWAYS	AUTO	-
Bits Allocated	0028,0100	US		ALWAYS	AUTO	-

Table 56: Cine Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame Time	0018,1065	DS		ALWAYS	AUTO	-
Recommended Display Frame Rate	0008,2144	IS		ALWAYS	AUTO	-
Cine Rate	0018,0040	IS		ALWAYS	AUTO	-

Table 56: Multi-Frame Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Frames	0028,0008	IS		ALWAYS	AUTO	-
Frame Increment Pointer	0028,0009	AT		ALWAYS	AUTO	-

Table 57: US Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED/SECONDARY	ALWAYS	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	0x00181065	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	0x0000	ALWAYS	AUTO	-
Lossy Image Compression	0028,2110	CS	00 or 01	ALWAYS	AUTO	-

Table 58: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO	Required if expanded/replacement character set used
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 59: Ultrasound Multi-Frame Extended Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Conversion Type	0008,0064	CS	SYN	ALWAYS	AUTO	-
Source Image Sequence	0008,2112	SQ		ALWAYS	AUTO	-
> Referenced SOP Class UID	0008,1150	UI		ALWAYS	AUTO	-
> Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	-
Protocol Name	0018,1030	LO		ALWAYS	AUTO	-
Window Center	0028,1050	DS	128	ALWAYS	AUTO	-
Window Width	0028,1041	DS	256	ALWAYS	AUTO	-

Table 60: Ultrasound Multi-Frame Private Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Cardiac Sync	2001,0010	LO	Philips Imaging DD 001	ANAP	AUTO	
Diffusion Echo time	2001,0011	LO	Philips Imaging DD 002	ANAP	AUTO	
Examination Source	2001,1063	CS		ANAP	AUTO	
Examination ID	2001,116C	LO		ANAP	AUTO	

Table 61: General Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Derivation Description	0008,2111	ST		ANAP	AUTO	

8.1.1.4. Comprehensive SR Storage SOP Class

Table 62: IOD of Created Comprehensive SR Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
	Patient Study Module	CONDITIONAL
Series	SR Document Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Document	SR Document General Module	ALWAYS
	SR Document Content Module	ALWAYS
	SOP Common Module	ALWAYS

Table 63: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Copied from source image
Patient ID	0010,0020	LO		VNAP	COPY	Copied from source image
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from source image
Patient's Sex	0010,0040	CS		VNAP	COPY	Copied from source image
Other Patient IDs	0010,1000	LO		VNAP	COPY	Copied from source image
Patient Comments	0010,4000	LT		VNAP	COPY	Copied from source image

Table 64: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		ALWAYS	COPY	Copied from source image
Study Time	0008,0030	TM		ALWAYS	COPY	Copied from source image
Accession Number	0008,0050	SH		VNAP	COPY	Copied from source image
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from source image
Study Description	0008,1030	LO		VNAP	COPY	Copied from source image
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	Copied from source image
Referenced SOP class	0008,1150	UI		VNAP	COPY	Copied from source image
Referenced SOP Instance	0008,1155	UI		VNAP	COPY	Copied from source image
Study Instance UID	0020,000D	UI		ALWAYS	COPY	Copied from source image
Study ID	0020,0010	SH		VNAP	COPY	Copied from source image

Table 65: Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Size	0010,1020	DS		ANAP	COPY	Copied from source image
Patient's Weight	0010,1030	DS		ANAP	COPY	Copied from source image
Additional Patient History	0010,21B0	LT		ANAP	COPY	Copied from source image

Table 66: SR Document Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DT		ALWAYS	AUTO	-
Series Time	0008,0031	TM		ALWAYS	AUTO	-
Modality	0008,0060	CS	SR	ALWAYS	AUTO	-
Series Description	0008,103E	LO		VNAP	AUTO	-
Referenced Performed Procedure Step Sequence	0008,1111	SQ		ANAP	AUTO	-
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	-
Series Number	0020,0011	IS		ALWAYS	AUTO	-

Table 67: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	AUTO	-
Manufacturer's Model Name	0008,1090	LO	QLAB	ALWAYS	AUTO	-
Software Version(s)	0018,1020	LO	QLAB 13.0	ANAP	AUTO	-

Table 68: SR Document General Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Content Date	0008,0023	DA		ALWAYS	AUTO	-
Content Time	0008,0033	TM		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-
Predecessor Documents Sequence	0040,A360	SQ		ALWAYS	AUTO	
Performed Procedure Code Sequence	0040,A372	SQ		ALWAYS	AUTO	-
Completion Flag	0040,A491	CS	PARTIAL	ALWAYS	AUTO	-
Verification Flag	0040,A493	CS	UNVERIFIED	ALWAYS	AUTO	-

Table 69: SR Document Content Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Value Type	0040,A040	CS	CONTAINER	ALWAYS	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	-
Continuity Of Content	0040,A050	CS		ALWAYS	AUTO	-
Concept Code Sequence	0040,A168	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	-
Content Template Sequence	0040,A504	SQ		ANAP	AUTO	-
>Mapping Resource	0008,0105	CS		ALWAYS	AUTO	
>Template Identifier	0040,DB00	CS		ALWAYS	AUTO	-
Content Sequence	0040,A730	SQ		ANAP	AUTO	-
>Relationship Type	0040,A010	CS	CONTAINS	ALWAYS	AUTO	-
>Value Type	0040,A040	CS		ALWAYS	AUTO	-
>Concept Name Code Sequence	0040,A043	SQ		ALWAYS	AUTO	-
>Continuity Of Content	0040,A050	CS	SEPARATE	ALWAYS	AUTO	-
>Value Type	0040,A040	CS		ALWAYS	AUTO	-

Table 70: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS		ANAP	AUTO	Filled if expanded/replacement character set used
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO	-
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-

8.1.1.5. Secondary Capture Image Storage SOP Class

Table 71: IOD of Created Secondary Capture Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
	Patient Study Module	CONDITIONAL
Series	General Series Module	ALWAYS

Equipment	General Equipment Module	ALWAYS
	SC Equipment Module	ALWAYS
Image	SC Image Module	ALWAYS
	General Image Module	ALWAYS
	Image Pixel Module	ALWAYS
	SOP Common Module	ALWAYS

Table 72: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		VNAP	COPY	Copied from source image
Patient ID	0010,0020	LO		VNAP	COPY	Copied from source image
Patient's Birth Date	0010,0030	DA		VNAP	COPY	Copied from source image
Patient's Sex	0010,0040	CS		VNAP	COPY	Copied from source image
Other Patient IDs	0010,1000	LO		ANAP	COPY	Copied from source image
Patient Comments	0010,4000	LT		ANAP	COPY	Copied from source image

Table 73: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Date	0008,0020	DA		VNAP	COPY	Copied from source image
Study Time	0008,0030	TM		VNAP	COPY	Copied from source image
Accession Number	0008,0050	SH		VNAP	COPY	Copied from source image
Referring Physician's Name	0008,0090	PN		VNAP	COPY	Copied from source image
Study Description	0008,1030	LO		ANAP	COPY	Copied from source image
Referenced Study Sequence	0008,1110	SQ		ANAP	COPY	Copied from source image
> Referenced SOP Class UID	0008,1150	UI		ANAP	COPY	Copied from source image
> Referenced SOP Instance UID	0008,1155	UI		ANAP	COPY	Copied from source image
Study Instance UID	0020,000D	UI		ALWAYS	COPY	Copied from source image
Study ID	0020,0010	SH		VNAP	COPY	Copied from source image

Table 74: Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Size	0010,1020	DS		ANAP	COPY	Copied from source image
Patient's Weight	0010,1030	DS		ANAP	COPY	Copied from source image
Additional Patient History	0010,21B0	LT		ANAP	COPY	Copied from source image

Table 75: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Date	0008,0021	DA		ANAP	AUTO	-
Series Time	0008,0031	TM		ANAP	AUTO	-
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	-
Series Number	0020,0011	IS		VNAP	AUTO	-
Performed Procedure Step Start Date	0040,0244	DA		ALWAYS	AUTO	-
Performed Procedure Step Start Time	0040,0245	TM		ALWAYS	AUTO	-
Performed Procedure Step ID	0040,0253	SH		ALWAYS	AUTO	-
Request Attributes Sequence	0040,0275	SQ		ANAP	COPY	-
> Requested Procedure Description	0032,1060	LO		ANAP	COPY	-
> Requested Procedure Code Sequence	0032,1064	SQ		ANAP	COPY	-
>> Code Value	0008,0100	SH		ANAP	COPY	-
>> Coding Scheme Designator	0008,0102	SH		ANAP	COPY	-
>> Code Meaning	0008,0104	LO		ANAP	COPY	-
> Scheduled Procedure Step Description	0040,0007	LO		ANAP	COPY	-
> Scheduled Protocol Code Sequence	0040,0008	SQ		ANAP	COPY	-
>> Code Value	0008,0100	SH		ANAP	COPY	-
>> Coding Scheme Designator	0008,0102	SH		ANAP	COPY	-
>> Code Meaning	0008,0104	LO		ANAP	COPY	-
> Scheduled Procedure Step ID	0040,0009	SH		ANAP	COPY	-
> Requested Procedure ID	0040,1001	SH		ANAP	COPY	-

Table 76: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips	ALWAYS	AUTO	
Institution Name	0008,0080	LO		ALWAYS	CONFIG	
Institution Address	0008,0081	ST		ALWAYS	CONFIG	
Institutional Department Name	0008,1040	LO		ALWAYS	CONFIG	
Manufacturer's Model Name	0008,1090	LO	QLAB 13.0	ALWAYS	AUTO	
Software Version(s)	0018,1020	LO	QLAB 13.0	ANAP	AUTO	-

Table 77: SC Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	US	ALWAYS	AUTO	-
Conversion Type	0008,0064	CS	WSD	ALWAYS	AUTO	-

Table 78: SC Image Module

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

Table 79: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED\SECONDARY	ALWAYS	AUTO	-
Content Date	0008,0023	DA		ALWAYS	AUTO	-
Content Time	0008,0033	TM		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-
Patient Orientation	0020,0020	CS		ALWAYS	AUTO	-
Burned In Annotation	0028,0301	CS		ANAP	AUTO	-
Lossy Image Compression	0028,2110	CS		ANAP	AUTO	-
Lossy Image Compression Method	0028,2114	CS	ISO_10918_1	ANAP	AUTO	-

Table 80: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US		ANAP	AUTO	-
Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO	RGB, YBR_FULL_422
Planar Configuration	0028,0006	US		ANAP	AUTO	-
Rows	0028,0010	US		ALWAYS	AUTO	-
Columns	0028,0011	US		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	OB		ALWAYS	AUTO	-

Table 81: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ANAP	AUTO	Filled if expanded/replacement character set used
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.7	ALWAYS	AUTO	-
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	-
Instance Number	0020,0013	IS		ALWAYS	AUTO	-

Table 82: Secondary Capture Extended Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Medical Alerts	0010,2000	LO		ANAP	COPY	Copied from source image
Allergies	0010,2110	LO		ANAP	COPY	Copied from source image
Pregnancy Status	0010,21C0	US		ANAP	COPY	Copied from source image
Special Needs	0038,0050	LO		ANAP	COPY	Copied from source image
Patient State	0038,0500	LO		ANAP	COPY	Copied from source image

Table 83: Secondary Capture Private Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Cardiac Sync	2001,0010	LO	Philips Imaging DD 001	ANAP	AUTO	
Diffusion Echo time	2001,0011	LO	Philips Imaging DD 002	ANAP	AUTO	
Examination Source	2001,1063	CS		ANAP	AUTO	
Examination ID	2001,116C	LO		ANAP	AUTO	

8.1.2. Usage of Attributes from Received IODs

The QLAB 13.0 only accepts all valid DICOM IOD's specified in this document. Some SOP Classes will not be viewable because they are application dependant.

8.1.3. Coerced/Modified fields

Upon export of composite instances a de-normalization can take place by assembling data from the various entities in the hierarchy. The selection of the attributes takes place based upon what is present in the QLAB 13.0 at the initiation of the export. A description is given in the following subsections per instance level.

Patient

If the patient ID attribute is absent during instance import (has no value – zero-length) the following mapping will take place.

1. When a Patient ID is absent and one of Patient's Name/Patient's Birth Date is absent then a new UID is generated for Patient ID. Otherwise Patient ID is generated by appending "EMPTYPatientID_" + <Patient's Name> + "_" + <Patient's Birth Date>. It will be ensured that all instances belonging to a particular study will get the same Patient ID.

2. For Storage SCP, when two or more SOP Instances have the same Patient ID and different values for Patient's Name/Patient's Birth Date, then a new Patient ID is created by appending "!" + <UID> to the Patient ID. The original Patient ID is added to the Other Patient IDs.

Study

During import, the value of Study ID attribute is determined as follows:

1. Retrieved from the composite image.
2. If not present in the composite image, Study ID is assigned the value of the first Requested Procedure ID (0040,1001) encountered in the Request Attributes Sequence (0040,0275) in the composite image.
3. Otherwise Study ID remains empty.

During Export, in the absence of Study attribute values, the Examination attributes will be taken as a best guess for the following Study attributes.

Table 84: Mapping of Study Attributes

Examination Attribute	Value	DICOM Attribute
Study Date (0008,0020)	Has value	Study date (0008,0020) is sent out
	Not present or has no value	Study date (0008,0020) is filled with Performed Procedure Step Start Date (0040,0244)
Study Time (0008,0030)	Has value	Study Time (0008,0030) is sent out
	Not present or has no value	Study Time (0008,0030) is filled with Performed Procedure Step Start Time (0040,0245)

This implies that upon export of each Examination, within the same Study, different values for these attributes may be sent out. The receiving station, e.g. a PACS system, will apply its own rules for guaranteeing consistency of its own database.

Examination

If all of the Performed Procedure Step attributes in the following table are missing from the composite image, then the mapping is as specified.

Table 85: Mapping of Examination attributes

Performed Procedure Step Attribute	Tag	Composite Image Attribute	Tag
Performed Procedure Step Start Date	(0040,0244)	Study Date	(0008,0020)
Performed Procedure Step Start Time	(0040,0245)	Study Time	(0008,0030)
Performed Procedure Step ID	(0040,0253)	Study ID	(0020,0010)
Performed Procedure Step Description	(0040,0254)	Study Description	(0008,1030)

8.2. Data Dictionary of Private Attributes

Not applicable.

8.3. Coded Terminology and Templates

QLAB 13.0 uses both Philips Private and DICOM Standard codes for Structured Reporting.

8.3.1. DICOM Structured report Export Specifications

8.3.2. Philips Healthcare Ultrasound Data Portal Website

Rather than list the thousands of DICOM export encodings in this document, the Philips Healthcare Ultrasound Data Portal website (see link below) provides detailed DICOM export specifications for all Philips ultrasound products in a convenient downloadable spreadsheet format. These spreadsheets allow users to quickly filter for specific areas of interests such as application, template, label,

or DICOM attribute. In addition to DICOM Structured Report specifications, the link also provides many DICOM Structured Report example files and images for import and display testing.

Philip Ultrasound Data Portal Website URL: <http://www.UltrasoundDataPortal.net.philips.com/portal/index.asp?pid=us>

To access the Philips Healthcare Ultrasound Data Portal,

- Using a browser, to navigate to the link below
- Select QLAB and Q-Station or EPIQ page
- Provide an email address and press the submit button
- In the DICOM Data section, download the desired DICOM SR samples for the desired version
- In the Documentation and Viewers section, download desired revision of the eDCS spreadsheet files for a comprehensive list of the measurement library

8.3.3. Template specific conformance for TID 5200

This template forms the top of a content tree that allows an ultrasound application to describe the results of a Cardiac Ultrasound imaging procedure.

No	NL	REL WITH PARENT	VT	Concept Name	VM	Presence of value	value
1			CONTAINER	EV (125200, DCM, Adult Echocardiography Procedure)	1	M	
BEGIN CONTAINER EV (121070, DCM, Findings)							
	>	HAS CONCEPT MOD	CODE	(G-C0E3, SRT, Finding Site)	1	M	
BEGIN CONTAINER DT (125007, DCM, Measurement Group)							
	>	CONTAINS	NUM	(18026-5, LN, Left Ventricular End Diastolic Volu			

No	NL	REL WITH PARENT	VT	Concept Name	VM	Presence of value	value
	>	HAS CONCEPT MOD	CODE	(G-C036, SRT, Measurement Method)			
	>	INFERRED FROM	IMAGE	[1.2.840.10008.5.1.4.1.1.3.1 1.3.46.670589.14.20001.309.2.4.46.678.1.4296.1519405075 015]			
	>>	HAS CONCEPT MOD	CODE	(R-4089A, SRT, Cardiac Cycle Point)			
	>	HAS CONCEPT MOD	CODE	(G-0373, SRT, Image Mode)			
	>	HAS CONCEPT MOD	CODE	(111031, DCM, Image View)			
	>	HAS CONCEPT MOD	CODE	(G-C036-99, 99PMSBLUS, Trace Method)			
	>	CONTAINS	NUM	(18148-7, LN, Left Ventricular End Systolic Volum			
	>	HAS CONCEPT MOD	CODE	(G-C036, SRT, Measurement Method)			
	>	INFERRED FROM	IMAGE	[1.2.840.10008.5.1.4.1.1.3.1 1.3.46.670589.14.20001.309.2.4.46.678.1.4296.1519405075 015]			
	>	HAS CONCEPT MOD	CODE	(R-4089A, SRT, Cardiac Cycle Point)			
	>	HAS CONCEPT MOD	CODE	(G-0373, SRT, Image Mode)			
	>	HAS CONCEPT MOD	CODE	(111031, DCM, Image View)			
	>	HAS CONCEPT MOD	CODE	(G-C036-99, 99PMSBLUS, Trace Method)			
	>	CONTAINS	NUM	(18148-7, LN, Left Ventricular End Systolic Volum			
	>	HAS CONCEPT MOD	CODE	(G-C036, SRT, Measurement Method)			

No	NL	REL WITH PARENT	VT	Concept Name	VM	Presence of value	value
	>	INFERRED FROM	IMAGE	[1.2.840.10008.5.1.4.1.1.3.1 1.3.46.670589.14.20001.309.2.4.46.678.1.4296.1519405075 015]			
	>	HAS CONCEPT MOD	CODE	(R-4089A, SRT, Cardiac Cycle Point)			
	>	HAS CONCEPT MOD	CODE	(G-0373, SRT, Image Mode)			
	>	HAS CONCEPT MOD	CODE	(111031, DCM, Image View)			
	>	HAS CONCEPT MOD	CODE	(G-C036-99, 99PMSBLUS, Trace Method)			
	>	CONTAINS	NUM	(18043-0, LN, Left Ventricular Ejection Fraction)			
	>	HAS CONCEPT MOD	CODE	(G-C036, SRT, Measurement Method)			
	>	INFERRED FROM	IMAGE	[1.2.840.10008.5.1.4.1.1.3.1 1.3.46.670589.14.20001.309.2.4.46.678.1.4296.1519405075 015]			
	>	HAS CONCEPT MOD	CODE	(G-0373, SRT, Image Mode)			
	>	HAS CONCEPT MOD	CODE	(111031, DCM, Image View)			
	>	HAS CONCEPT MOD	CODE	(G-C036-99, 99PMSBLUS, Trace Method)			
BEGIN CONTAINER EV (121070, DCM, Findings)							
BEGIN TEMPLATE INCLUDE ID (TID): 5203 - Name: "Echo Measurement" Type: Extensible Order: Significant							
	PRIVATE >	HAS CONCEPT MOD	CODE	(121058, DCM, Procedure reported)			
	>	CONTAINS	CONTAINER	(121070, DCM, Findings)			

No	NL	REL WITH PARENT	VT	Concept Name	VM	Presence of value	value
	>	HAS CONCEPT MOD	CODE	(G-C0E3, SRT, Finding Site)	1	M	
BEGIN CONTAINER NODE [(125007, DCM, Measurement Group)] CONTAINS CONTAINER [(125007, DCM, Measurement Group)] [SEPARATE]							
	>	CONTAINS	NUM	(C12203-89, 99PMSBLUS, Endo Peak Strain of Left V			
	>	HAS CONCEPT MOD	CODE	(G-C036, SRT, Measurement Method)			
	>	INFERRED FROM	IMAGE	[1.2.840.10008.5.1.4.1.1.3.1 1.3.46.670589.14.20001.309.2.4.46.678.1.4296.1519405075 015]			
	>	HAS CONCEPT MOD	CODE	(G-0373, SRT, Image Mode)	1	M	
	>	HAS CONCEPT MOD	CODE	(111031, DCM, Image View)			
	>	HAS CONCEPT MOD	CODE	(G-C036-99, 99PMSBLUS, Trace Method)			

8.3.4. Context Groups

Not Applicable

8.3.5. Template Specifications

Not applicable.

8.3.6. Private code definitions

Not Applicable

8.4. Grayscale Image consistency

QLAB does not implement any specific support for grayscale image consistency.

8.5. Standard Extended/Specialized/Private SOPs

Table 86: List of created SOP Classes

SOP Class Name	SOP Class UID
Private 3D Presentation State Storage SOP class	1.3.46.670589.2.5.1.1

8.5.1. Standard Extended/Specialized/Private SOP Instance

QLAB 13.0 supports the Private 3D Presentation State Storage SOP Class, 1.3.46.670589.2.5.1.1, used for the storage of the saved 3D Subpages in Qlab.

8.6. Private Transfer Syntaxes

QLAB 13.0 does not support any private transfer syntaxes.