

**IQQA-Chest  
DICOM Conformance Statement**

**Product Version: v 2.0**

**Date: 7/26/2006**

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## **1 INTRODUCTION**

This document describes the DICOM Conformance Statement for the IQQA-Chest V1.2 software application developed by EDDA Technology. Contained in this statement are detailed descriptions of how IQQA-Chest V1.2 collaborates with other medical imaging devices and applications that conform to the DICOM 3.0 standard.

### **1.1 DEFINITIONS, ACRONYMS, ABBREVIATIONS**

The following symbols and abbreviations are used in this document.

AE	Application Entity
PDU	Protocol Data Unit
CS	Code String
DCMTK	OFFIS DICOM Toolkit
GUI	Graphical User Interface
PN	Person Name
LO	Long String
DA	Date
TM	Time
SH	Short String
UI	Unique Identifier
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
UID	Unique Identifier
VR	Value Representation
TCP/IP	Transmission Control Program/Internet Protocol
UL	Upper Layers
RQ	Request
RSP	Response

Blank entries in tables indicate “not applicable”.

### **1.2 REFERENCES**

All necessary references are taken from Digital Imaging and Communications in Medicine (DICOM) standard, parts 1 through 8.

## 2 IMPLEMENTATION MODEL

### 2.1 APPLICATION DATA FLOW DIAGRAM

The following diagram depicts the Application Entities (AE) and their relationships to Real World Activities.

Verification:

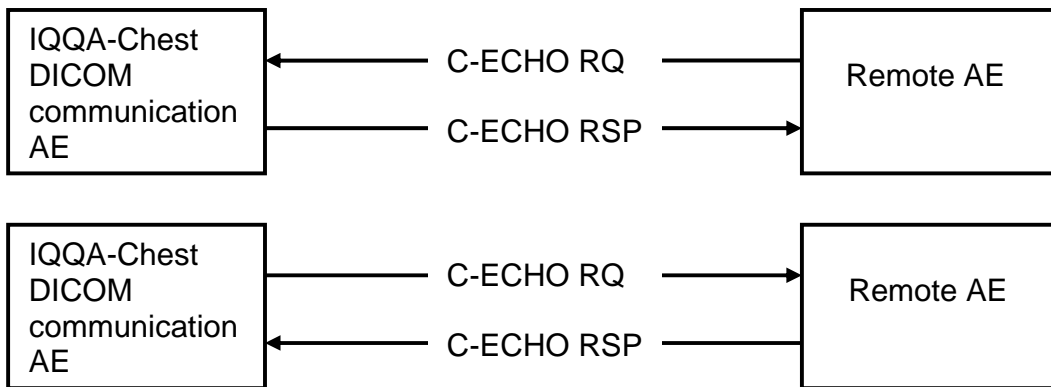


Image find:

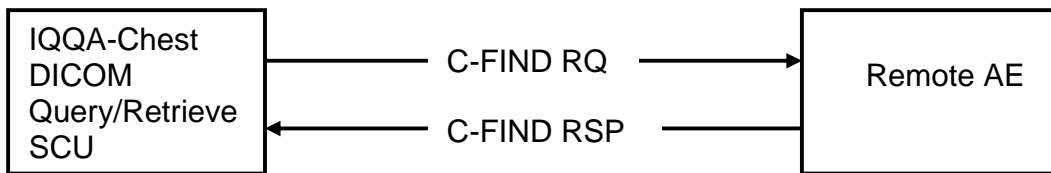
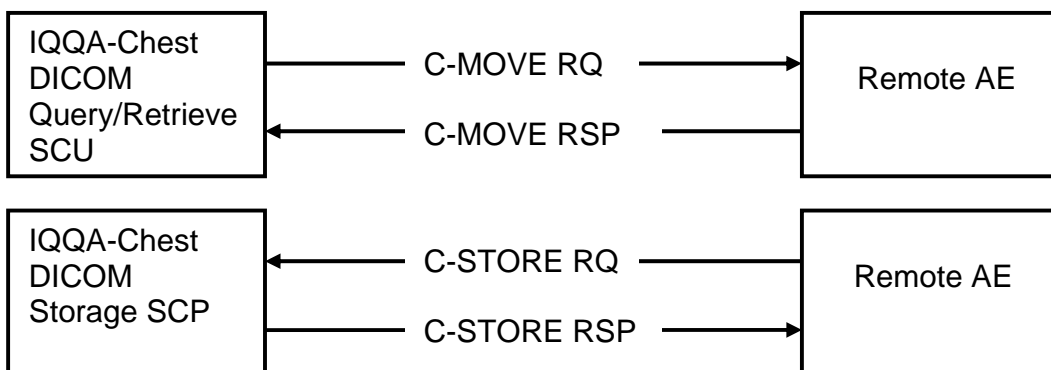


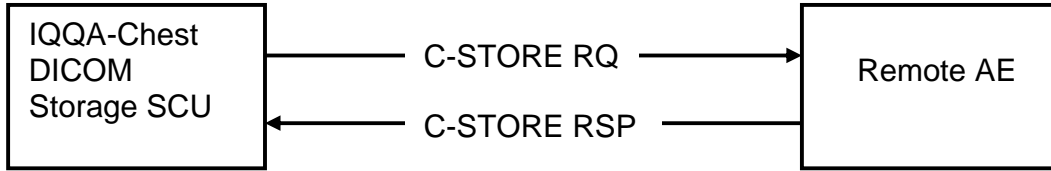
Image transfer:



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**2.2 FUNCTIONAL DEFINITION OF APPLICATION ENTITIES**

Local AE	Role	Services to send	Services to receive
Computed Radiography Image Storage	SCP		C-STORE response
Study Root Query– FIND	SCU	C-FIND request	C-FIND response
Study Root Retrieval Information Model – MOVE	SCU	C-MOVE request	C-MOVE response
Diagnosis Report Send	SCU	C-STORE request	

**2.3 SEQUENCING OF REAL WORLD ACTIVITIES**

Receiving images pushed from a remote entity:

- Remote entity initiates a DICOM Storage SCP association;
- Local AE (Storage SCP) responds to the remote association and selects a matching Presentation Context.
- Remote entity sends a C-STORE request;
- Local AE accepts the request and stores incoming DICOM image into hard drive disk;

Query/Retrieve images from a remote entity:

- Local AE (Query/Retrieve SCU) initiates an association to a remote entity;
- Local AE sends a C-FIND request with the query conditions from the GUI input of IQQA-Chest Workstation;
- Local AE displays query results on the GUI of IQQA-Chest Workstation;
- Local AE sends a C-MOVE request to the remote AE with study list selected from the GUI of IQQA-Chest Workstation.
- Remote entity responds with the C-MOVE operation;
- Local AE receives DICOM images and store them onto hard disk;

Sending icon images to a remote entity:

- Local AE (Storage SCU) initiates an association to a remote entity;
- Local AE sends a C-STORE request to the remote entity;
- Remote entity responds;

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- Local AE closes the association;

Sending diagnosis reports to a remote entity:

- Local AE (Storage SCU) initiates an association to a remote entity;
- Local AE sends a C-STORE request to the remote entity;
- Remote entity responds;
- Local AE closes the association;

### 3 AE SPECIFICATIONS

#### 3.1 LOCAL DICOM STORAGE SCP

The IQQA-Chest Storage SCP supports the following image storage SOP Classes:

SOP Class Name	SOP Class UID
CR image Storage	1.2.840.10008.5.1.4.1.1.1
DX image Storage	1.2.840.10008.5.1.4.1.1.1.1

##### 3.1.1 Association Establishment Policies

###### 3.1.1.1 General

The Max PDU (the maximum size of the receiving PDU block) of the IQQA-Chest Workstation is 64K. However, if the remote AE negotiates a smaller value, the smaller value will be used for sending. IQQA-Chest Workstation will receive any PDU size smaller or equal to its Max PDU.

###### 3.1.1.2 Number of Associations

The IQQA-Chest Workstation AE accepts one association at a time from the top of the transfer queue.

###### 3.1.1.3 Asynchronous Nature

IQQA-Chest Workstation AE does not support asynchronous operations. All operations are performed synchronously.

###### 3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: 1.2.276.0.7230010.3.0.3.5.3, and the implementation version number is OFFIS\_DCMTK\_353.

##### 3.1.2 Association Initialization by Real-World Activity

The local Storage SCP does not initiate associations.

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### 3.1.3 Association Acceptance Policy

The IQQA-Chest Storage SCP accepts an association when it receives a valid association request, with at least one matching presentation context.

#### 3.1.3.1 Receiving Images from a Remote DICOM Storage SCU

##### 3.1.3.1.1 Associated Real-World Activity

The C-STORE SCP operation is triggered by a DICOM push operation from a remote DICOM Storage SCU. A failure status will be sent to the remote Storage SCU if C-STORE SCP is unable to store the images.

##### 3.1.3.1.2 Presentation Context Table

The IQQA-Chest Storage SCP accepts the Presentation Contexts shown in the following table

Abstract syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
CR image Storage	1.2.840.10008.5.1.4.1.1.1	See Below	See Below	SCP	None
DX image Storage	1.2.840.10008.5.1.4.1.1.1.1	See Below	See Below	SCP	None

Supported transfer syntaxes for receiving images from a remote system are:

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
Explicit VR Big Endian	1.2.840.10008.1.2.2
JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14[Selection Value 1])	1.2.840.10008.1.2.4.70

##### 3.1.3.1.3 SOP Specific Conformance

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



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The IQQA-Chest AE responds to a C-STORE request with one of the response codes listed below:

<b>Service Status</b>	<b>Status description</b>	<b>Status Code (0000,0090)</b>
Error	Cannot understand: The received message was not properly DICOM encoded, or the SOP class is not recognized or supported;	0x0201
Success	Success	0x0000

#### **3.1.3.1.4 Presentation Context Acceptance Criterion**

The IQQA-Chest DICOM Storage SCP accepts any of the Presentation Contexts listed in the Presentation Context Table in 3.1.3.1.2.

#### **3.1.3.1.5 Transfer Syntax Selection Polices**

The first item from the Transfer Syntax Table in 3.1.3.1.2 that matches the proposed Transfer Syntax will be selected. If no Transfer Syntax matches, the Presentation Context will be rejected.

### **3.2 LOCAL DICOM QUERY/RETRIEVE SCU**

The IQQA-Chest AE conforms to the following DICOM SOP Class as an SCU:

<b>SOP Class Name</b>	<b>SOP Class UID</b>
Study Root Query/Retrieval Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieval Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2

#### **3.2.1 Association Establishment Policy**

The IQQA-Chest AE as an SCU initiates association, but does not accept associations.

##### **3.2.1.1 General**

The default maximum PDU is 64K.

##### **3.2.1.2 Number of Associations**

There is one association initiated at a time.

##### **3.2.1.3 Asynchronous Nature**

IQQA-Chest 1.2 AE does not support asynchronous operations. All operations are performed synchronously.

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**3.2.1.4 Implementation Identifying Information**

The Implementation Class UID is: 1.2.276.0.7230010.3.0.3.5.3, and the implementation version number is OFFIS\_DCMTK\_353.

**3.2.2 Association Initialization by Real-World Activity**

The local Storage SCP does not initiate associations.

**3.2.2.1 Associated Real-World Activity**

User triggers C-FIND and C-MOVE operations through the GUI of IQQA-Chest Workstation. The retrieved images will be stored in the database of IQQA-Chest Workstation.

**3.2.2.2 Proposed Presentation Contexts**

The IQQA-Chest accepts the following Presentation Contexts:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root	1.2.840.10008.5.1.4.1.2.2.1	See	See	SCU	None
Query/Retrieval Information Model – FIND		Below	Below		
Study Root	1.2.840.10008.5.1.4.1.2.2.2	See	See	SCU	None
Query/Retrieval Information Model – MOVE		Below	Below		

The following transfer syntaxes are supported for receiving images from a remote system:

Name	Transfer Syntax	UID
Implicit VR Little Endian		1.2.840.10008.1.2
Explicit VR Little Endian		1.2.840.10008.1.2.1
Explicit VR Big Endian		1.2.840.10008.1.2.2
JPEG Baseline (Process 1)		1.2.840.10008.1.2.4.50
JPEG Extended (Process 2 & 4)		1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical,First-Order Prediction (Process 14[Selection Value 1])		1.2.840.10008.1.2.4.70

**3.2.2.3 SOP Specific Conformance**

The following DICOM keys are used for query and retrieval:

Element	Tag	Type	Length
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<b>Study Level:</b>			
PatientName	0010,0010	PN	1024
PatientID	0010,0020	LO	1024
StudyID	0020,0010	SH	1024
StudyInstanceUID	0020,000D	UI	128
StudyDate	0008,0020	DA	32
Modality	0008,0061	CS	1024
<b>Series Level:</b>			
SeriesInstanceUID	0002,000E	UI	128
Modality	0008,0060	CS	1024
BodyPart	0018,0015	CS	1024
<b>Image Level:</b>			
SOPInstanceUID	0008,0018	UI	128

The result of query may include the following DICOM elements:

Element	Tag	Type	Length
Patient Name	0010,0010	PN	1024
Patient ID	0010,0020	LO	1024
Birth Date	0010,0030	DA	32
Patient Sex	0010,0040	CS	16
Other Patient ID	0010,1000	LO	256
Other Patient Name	0010,1001	PN	256
Study ID	0020,0010	SH	1024
Study Instance UID	0020,000D	UI	128
Accession Num	0008,0050	SH	32
Study Date	0008,0020	DA	32
Study Time	0008,0030	TM	32
Patient Age	0010,1010	AS	16
Series Instance UID	0020,000E	UI	128
Body Part	0018,0015	CS	1024
Modality	0008,0060	CS	1024
SOP Instance UID	0008,0018	UI	128
Content Date	0008,0023	DA	32
Content Time	0008,0033	TM	32

### 3.2.3 Association Acceptance Policy

The IQQA-Chest DICOM Query/Retrieve SCU does not accept associations.

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### 3.3 LOCAL DICOM STORAGE SCU

IQQA-Chest will send an icon image to a remote system. Users may generate a diagnosis report in DICOM format and send to a remote system. The IQQA-Chest DICOM Storage SCU conforms to the following DICOM SOP class as an SCU:

SOP Class Name	SOP Class UID
CR image Storage	1.2.840.10008.5.1.4.1.1.1
DX image Storage	1.2.840.10008.5.1.4.1.1.1.1

The exact SOP Class used depends on the input image: it will be the same as that of the input image.

#### 3.3.1 Association Establishment Policy

IQQA-Chest Storage SCU initiates associations, but never accepts associations.

##### 3.3.1.1 General

The maximum PDU size that IQQA-Chest SCU AE will use is 64K.

##### 3.3.1.2 Number of Associations

The IQQA-Chest SCU AE initiates one association at a time. Multiple remote Storage SCPs may be specified for receiving the report. IQQA-Chest Storage SCU initiates associations sequentially.

##### 3.3.1.3 Asynchronous Nature

The IQQA-Chest SCU AE does not support asynchronous operations.

##### 3.3.1.4 Implementation Identifying Information

The Implementation Class UID is: 1.2.276.0.7230010.3.0.3.5.3, and the implementation version number is OFFIS\_DCMTK\_353.

#### 3.3.2 Association Initialization by Real-World Activity

The local Storage SCP does not initiate associations.

##### 3.3.2.1 Associated Real-World Activity

After the processing a study, an icon image is sent to the remote AE. Upon the completion of a diagnosis report by user on the IQQA-Chest application, the IQQA-Chest DICOM SCU initiates a C-STORE operation request to Remote DICOM Storage SCPs.

##### 3.3.2.2 Proposed Presentation Contexts

The IQQA-Chest application initiates a C-STORE operation request with the following Presentation Contexts

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<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>
<b>Name</b>	<b>UID</b>	<b>Name</b>	<b>UID</b>		
CR image Storage	1.2.840.10008.5.1.4.1.1.1	See Below	See Below	SCU	None
DX image Storage	1.2.840.10008.5.1.4.1.1.1.1	See Below	See Below	SCU	None

The Transfer Syntax is shown in the table below. IQQA-Chest can configure which transfer syntax to use.

<b>Transfer Syntax</b>	
<b>Name</b>	<b>UID</b>
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14[Selection Value 1])	1.2.840.10008.1.2.4.70
Implicit VR Little Endian	1.2.840.10008.1.2

**3.3.2.3 SOP Specific Conformance**

The following attributes of an icon image or a DICOM report may possess a value:

<b>Element</b>	<b>Tag</b>
Patient Name	0010,0010
Patient ID	0010,0020
SOP class UID	0008,0016
Accession number	0008,0050
Study ID	0020,0010
Patient 's birth date	0010,0030
Patient's sex	0010,0040
Rows	0028,0010
Columns	0028,0011
Bit Allocated	0028,0100
Bit Stored	0028,0101
Photometric interpretation	0028,0004
Study Instance UID	0020,000D
Manufacturer	0008,0070
Manufacturer's model name	0008,1090
Series Instance UID	0020,000E
Modality	0008,0060
SOP Instance UID	0008,0018
Samples per Pixel	0028,0002
Pixel Data	7FE0,0010

## 4 COMMUNICATION PROFILES

### 4.1 SUPPORTED PROTOCOL STACKS

The IQQA system provides DICOM 3.0 TCP/IP Network Communication Support as defined in Part 8 of DICOM standard.

### 4.2 OSI STACK

No OSI Stack communications are provided.

### 4.3 TCP/IP STACK

IQQA-Chest Workstation supports TCP/IP stack.

### 4.4 PHYSICAL MEDIA SUPPORT

The DICOM implementation operates on top of the TCP/IP stack, and does not have specific requirement regarding the physical network media. The default connection port is the Ethernet. (Common network media supported by DICOM include Token Ring, FDDI, ATM, ISDN, and dedicated T1, T3, and other types of digital or digital/audio lines.)

## 5 CONFIGURATION

### 5.1 AE TITLE/PRESENTATION ADDRESS MAPPING

The local AE title can be configured by authorized personnel. Configurations may be changed through the GUI of the IQQA-Chest Workstation Configuration program.

### 5.2 CONFIGURATION PARAMETERS

Images from specific vendors that are allowed for IQQA processing may be specified through the configuration of the (0008,0070) attribute (Manufacturer) of the DICOM tag.

Local communication configuration can be specified as follows

- AE: AE title of IQQA-Chest Workstation. Maximum byte is 16 bytes.
- Port: Local communication port number (the default port number is 1949). The range applicable for setting is between 104 and 65535

Remote communication parameters for data import (Query/Retrieve and remote Push) include

- AE: AE title of remote system. Maximum byte is 16 bytes.
- IP: The IP address of the remote AE.
- Port: The remote port number of the AE.

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Remote communication parameters for report export include

- AE: AE title of the remote Storage SCP for receiving report. Maximum byte is 16 bytes.
- IP: The IP address of the remote AE.
- Port: The remote port number of the AE.

## 6 SUPPORT OF EXTENDED CHARACTER SETS

IQQA-Chest Workstation supports the use of the Chinese Character Repertoire in applicable value representations, such as in Patient's Name.

## 7 APPENDIX: SUPPORTED DICOM ELEMENTS

The DICOM data elements accessed by the IQQA-Chest system through the image load interface include the following. Extra elements may be supported, depending on the configuration setting.

Tag	Attribute Name	VR	Value length
<b>Patient Module</b>			
0010,0010	Patient's name	PN	1024 chars maximum
0010,0020	Patient ID	LO	1024 chars maximum
0010,0040	PatientSex	CS	16 chars maximum
0010,0030	PatientBirthDate	DA	32 chars maximum
0010,1000	OtherPatientID	CS	128 chars maximum
0010,1001	OtherPatientNames	LO	128 chars maximum
<b>General Study Module</b>			
0020,000D	Study Instance UID	UI	256 chars maximum
0008,0020	Study Date	DA	32 chars maximum
0008,0030	Study Time	DA	32 chars maximum
0008,0090	Referring Physician's Name	PN	256 chars maximum
0020,0010	Study ID	SH	1024 chars maximum
0008,0050	Accession Number	SH	128 chars maximum
<b>Patient Study Module</b>			
0010,1010	Patient's Age	AS	
<b>General Series Module</b>			
0008,0060	Modality	CS	1024 chars maximum
0020,000E	Series Instance UID	UI	128 chars maximum
0020,0011	Series Number	IS	

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0008,0021	Series Date	DA	32 chars maximum
0018,0015	Body Part Examined	CS	
0018,5100	Patient Position	CS	
<b>General Image Module</b>			
0020,0013	Instance Number	IS	
0020,0020	Patient Orientation	CS	
0008,0023	Content Date	DA	32 chars maximum
0008,0033	Content Time	DA	32 chars maximum
0008,0018	SOP Instance UID	UI	128 chars maximum

<b>General Equipment Module</b>			
0008,0070	Manufacturer	LO	
0008,0080	Institution Name	LO	
<b>VOI LUT Module</b>			
0028,1050	Window Center	DS	
0028,1051	Window Width	DS	
<b>X-ray Acquisition Module</b>			
0018,1151	X-ray tube current	IS	
0018,0060	KVP	DS	
0018,1150	Exposure time	IS	
<b>Image Plane Module</b>			
0028,0030	Pixel Spacing	DS	
<b>General Pixel Module</b>			
0028,0010	Rows	US	
0028,0011	Columns	US	
0028,0030	Pixel spacing	DS	
0028,0100	Bit Allocated	US	
0028,0101	Bit Stored	US	
0028,0102	High Bit	US	
0028,0004	Photometric interpretation	CS	
7FE0,0010	Pixel Data		