

# **Dicom 3.0 Conformance Statement**

**For the**

## **X-Console DR Upgrade**

**Edge Medical Devices LTD.**

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## 0 Introduction

This document describes the conformance of the Edge Medical Devices X-Console – Digital Radiography Upgrade product to the DICOM 3.0 standard.

This conformance statement is intended as a reference for persons who want to use the X-Console in a DICOM environment. The reader is assumed to be familiar with the DICOM standard.

## 1 Implementation Model

The X-Console is a Digital Radiography modality, which produces Dicom DX images acquired from the Edge Quix-100 digital detector.

The X-Console support the following two Dicom Service Classes for exporting the DX images:

- Digital X-Ray Image Storage - For Presentation
- Print Management

### 1.1 Application Data Flow Diagram

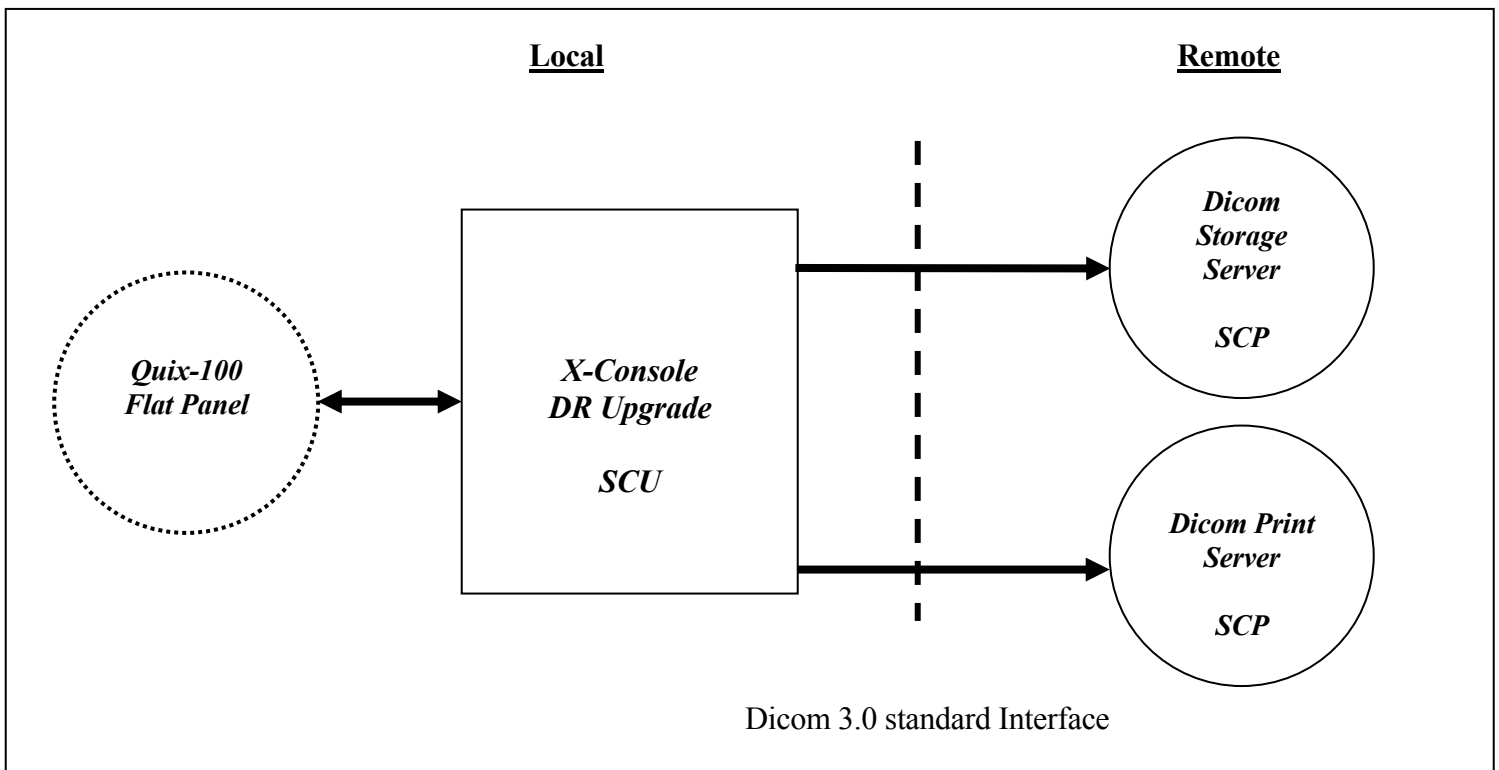


Figure 1: Implementation Model

## 1.2 Functional Definition

The X-Console is a Dicom client: the supported service classes consist of SCU implementation. The X-Console utilizes a single AE for communicating with all remote Dicom servers.

## 2 AE Specifications

### 2.1 X-Console

The Edge X-Console AE provides standard conformance to the following DICOM V3.0 SOP Classes as a SCU:

Table 2.1-1: Supported SOP Classes

SOP Class Name	SOP Class UID
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1. 9

#### 2.1.1 Association Establishment

##### 2.1.1.1 General

The X-Console SCU maintains an independent communication channel with each Dicom SCP. The X-Console may establish a single association with each remote Dicom SCP.

The maximum negotiable PDU length is 28672.

##### 2.1.1.2 Number of Associations

The X-Console maintains a single association per Dicom SCP server.

##### 2.1.1.3 Asynchronous Nature

The X-Console does not perform asynchronous operations.

##### 2.1.1.4 Implementation Identifying Information

Edge UID – TBD

#### 2.1.2 Association Initiation

An X-Console export task is defined as queuing/spooling of an X-Console Dicom DX file to a Dicom SCP.

The X-Console will initiate an association per export task - i.e. two export tasks will always result in two associations. In the case of two export tasks for two different Dicom SCP's – two separate associations will be active simultaneously. However, two export tasks for a single Dicom SCP will be carried sequentially and not simultaneously.

An export task is always initiated by a specific operator action:

- “Accepting an image after patient exposure”
- “Manual image export from database”

### 2.1.2.1 Image Storage

#### 2.1.2.1.1 Presentation Context

Table 2.1.2.1.1-1: Proposed Presentation Context for X-Console and Image Storage

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	NONE

#### 2.1.2.1.2 Specific Conformance

The X-Console SCU will guarantee provide the following attributes on Digital X-Ray Image Storage - For Presentation negotiation:

Patient Module			
Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient's full legal name.
Patient ID	(0010,0020)	2	Primary hospital identification number or code for the patient.
Patient's Birth Date	(0010,0030)	2	Birth date of the patient.
Patient's Sex	(0010,0040)	2	Sex of the named patient.

General Study Module			
Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Unique identifier for the Study.
Study Date	(0008,0020)	2	Date the Study started.
Study Time	(0008,0030)	2	Time the Study started.
Referring Physician's Name	(0008,0090)	2	Patient's referring physician
Study ID	(0020,0010)	2	User or equipment generated Study identifier.
Accession Number	(0008,0050)	2	A RIS generated number, which identifies the order for the Study.

General Series Module			
Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	<u>DX</u> (Type of equipment)
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
Series Number	(0020,0011)	2	A number that identifies this Series.
Operators' Name	(0008,1070)	3	Technologist(s) supporting the Series

DX series Module			
Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	<u>DX</u> (Type of equipment)
Presentation Intent Type	(0008,0068)	1	<u>FOR PRESENTATION</u> (Identifies the intent of the images)

General Equipment Module			
Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	<u>Edge Medical Devices</u> (Manufacturer of the equipment that produced the digital images)
Institution Name	(0008,0080)	3	Institution where the equipment is located that produced the digital images.

Institution Address	(0008,0081)	3	Mailing address of the institution where the equipment is located that produced the digital images.
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the digital images.
Institutional Department Name	(0008,1040)	3	Department in the institution where the equipment is located that produced the digital images
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the digital images.
Software Versions	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the digital images.
Date of Last Calibration	(0018,1200)	3	Date when the image device calibration was last changed in any way.
Time of Last Calibration	(0018,1201)	3	Time when the image device calibration was last changed in any way.

General Image Module			
Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	<b>1</b> (number that identifies this image)
Image Date	(0008,0023)	2C	Date the image pixel data creation started
Image Time	(0008,0033)	2C	Time the image pixel data creation started
Image Type	(0008,0008)	1	<b>ORIGINAL</b> Pixel Data Characteristics)
Burned In Annotation	(0028,0301)	1	NO (Indicates whether or not image contains sufficient burned in annotation)
Lossy Image Compression	(0028,2110)	1	00 (Specifies whether an Image has undergone
Patient Orientation	(0020,0020)	1	Patient direction of the rows and columns of the image. See C.7.6.1.1.1 for further explanation.

Image Pixel Module			
Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	<b>1</b> (Number of samples (planes) in this image)
Photometric Interpretation	(0028,0004)	1	<b>MONOCHROME2</b> (intended interpretation of the pixel data)
Rows	(0028,0010)	1	Number of rows in the image
Columns	(0028,0011)	1	Number of columns in the image
Bits Allocated	(0028,0100)	1	<b>16</b> (Number of bits allocated for each pixel sample)
Bits Stored	(0028,0101)	1	<b>12</b> (Number of bits stored for each pixel sample)
High Bit	(0028,0102)	1	<b>11</b> (Most significant bit for pixel sample data)
Pixel Representation	(0028,0103)	1	<b>0</b> (Data representation of the pixel samples)
Pixel Data	(7FE0,0010)	1	A data stream of the pixel samples which comprise the Image

DX Anatomy Imaged Module			
Attribute Name	Tag	Type	Attribute Description
Image Laterality	(0020,0062)	1	Laterality of (possibly paired) body part
Anatomic Region Sequence	(0008,2218)	2	Sequence that identifies the anatomic region of interest in this image

DX Image Module			
Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	<b>ORIGINAL</b> Pixel Data Characteristics)
Samples per Pixel	(0028,0002)	1	<b>1</b> (Number of samples (planes) in this image)
Photometric Interpretation	(0028,0004)	1	<b>MONOCHROME2</b> (intended interpretation of the pixel data)
Rows	(0028,0010)	1	Number of rows in the image
Columns	(0028,0011)	1	Number of columns in the image
Bits Allocated	(0028,0100)	1	<b>16</b> (Number of bits allocated for each pixel sample)
Bits Stored	(0028,0101)	1	<b>12</b> (Number of bits stored for each pixel sample)
High Bit	(0028,0102)	1	<b>11</b> (Most significant bit for pixel sample data)
Pixel Intensity Relationship	(0028,1040)	1	<b>LIN</b> (The relationship between the Pixel sample values and the X-Ray beam intensity)

Pixel Intensity Relationship Sign	(0028,1041)	1	<b>-1</b> (The sign of the relationship between the Pixel sample values stored in Pixel Data (7FE0,0010) and the X-Ray beam intensity)
Rescale Intercept	(0028,1052)	1	<b>0</b> (The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b.
Rescale Slope	(0028,1053)	1	<b>1</b> (m in the equation specified by Rescale Intercept (0028,1052))
Rescale Type	(0028,1054)	1	<b>US</b> (Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052) )
Presentation LUT Shape	(2050,0020)	1	<b>IDENTITY</b> (Specifies an identity transformation for the Presentation LUT)
Lossy Image Compression	(0028,2110)	1	<b>00</b> (Specifies whether an Image has undergone
Patient Orientation	(0020,0020)	1	Patient direction of the rows and columns of the image. See C.7.6.1.1.1 for further explanation.
Burned In Annotation	(0028,0301)	1	<b>NO</b> (Indicates whether or not image contains sufficient burned in annotation)
Window Center	(0028,1050)	1C	Defines a Window Center for display
Window Width	(0028,1051)	1C	Window Width for display

DX Detector Module			
Attribute Name	Tag	Type	Attribute Description
Detector Type	(0018,7004)	2	DIRECT (The type of detector used to acquire this image)
Detector Configuration	(0018,7005)	3	AREA (The physical configuration of the detector)
Detector Description	(0018,7006)	3	Quix-100
Detector ID	(0018,700A)	3	The ID or serial number of the detector used to acquire this image.
Date of Last Detector Calibration	(0018,700C)	3	The date on which the detector used to acquire this image as identified in Detector ID (0018,700A) was last calibrated
Time of Last Detector Calibration	(0018,700E)	3	The time at which the detector used to acquire this image as identified in Detector ID (0018,700A) was last calibrated
Sensitivity	(0018,6000)	3	Detector sensitivity in manufacturer specific units
Field of View Dimension(s)	(0018,1149)	3	Dimensions in mm of the Field of View, that is the image pixels stored in Pixel Data (7FE0,0010). RECTANGLE: row dimension followed by column.
Field of View Shape	(0018,1147)	3	RECTANGLE Shape of the Field of View, that is the image pixels stored in Pixel Data (7FE0,0010).
Field of View Rotation	(0018,7032)	1C	Clockwise rotation in degrees of Field of View, that is the image pixels stored in Pixel Data (7FE0,0010), relative to the physical detector. Enumerated Values: 0, 90, 180, 270
Field of View Horizontal Flip	(0018,7034)	1C	Whether or not a horizontal flip has been applied to the Field of View, that is the image pixels stored in Pixel Data (7FE0,0010), after rotation relative to the physical detector as described in Field of View Rotation (0018,7032).
Field of View Origin	(0018,7030)	1C	0,0 Offset of the TLHC of a rectangle circumscribing the Field of View, that is the image pixels stored in Pixel Data (7FE0,0010), before rotation or flipping.

DX Positioning Module			
Attribute Name	Tag	Type	Attribute Description
View Code Sequence	(0054,0220)	3	Sequence that describes the projection of the anatomic region of interest on the image receptor

VOI LUT Module			
Attribute Name	Tag	Type	Attribute Description
Window Center	(0028,1050)	1C	Defines a Window Center for display
Window Width	(0028,1051)	1C	Window Width for display

SOP Common Module			
Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	<b>1.2.840.10008.5.1.4.1.1.1.1</b> Uniquely identifies the SOP class.
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance.
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created.
Instance Creator UID	(0008,0014)	3	Uniquely identifies device which created the SOP Instance.

## 2.1.2.2 Image Print

### 2.1.2.2.1 Presentation Context

Table 0-1: Proposed Presentation Context for X-Console and Print Management

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1. 9	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See table 0-2

The following table contains lists of the mandatory SOP Classes implied by the Basic Grayscale Print Management Meta SOP Classes:

Table 0-2: Mandatory SOP Classes in Basic Grayscale Print Management Meta SOP Class

SOP Class Name	UID
Basic Film Session	1.2.840.10008.5.1.1.1
Basic Film Box	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4
Printer	1.2.840.10008.5.1.1.16

### 2.1.2.2.2 Specific Conformance

The X-Console SCU will guarantee provide the following SOP classes and attributes on Basic Grayscale Print Management Meta negotiation:

#### 2.1.2.2.2.1 Basic Film Session

Basic Film Session: N-Create
------------------------------

Attribute Name	Tag	Usage Scu/scp	Valid Range	Default
Number of Copies	(2000,0010)	U/M	1-99	-
Print Priority	(2000,0020)	U/M	Low, Medium, High	Low
Medium Type	(2000,0030)	U/M	Paper, Clear Film, Blue Film	-

#### 2.1.2.2.2 Basic Film Box

Basic Film Box: N-Create				
Attribute Name	Tag	Usage Scu/scp	Valid Range	Default
Image Display Format	(2010,0010)	U/M	STANDARD\1,1	STANDARD\1,1
Film Orientation	(2010,0040)	U/M	PORTRAIT, LANDSCAPE	-
Film Size ID	(2010,0050)	U/M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN, 14INX14IN, 14INX17IN 24CMX24CM, 24CMX30CM	-

#### 2.1.2.2.3 Basic Grayscale Image Box

Basic Grayscale Image Box: N-Set				
Attribute Name	Tag	Usage Scu/scp	Valid Range	Default
Image Position	(2020,0010)	M/M	1	<u>1</u>
Photometric Interpretation	(0028,0004)	M/M	MONOCHROME2	<u>MONOCHROME2</u>
Preformatted Grayscale Image Sequence	(2020,0110)	M/M		
Requested Image Size	(2020,0030)	U/U		
Requested Decimate/Crop Behavior	(2020,0040)	U/U	CROP	CROP
>Rows	(0028,0010)	M/M	1..4096	-
>Columns	(0028,0011)	M/M	1..4096	-
>Pixel Aspect Ratio	(0028,0034)	M/M	1\1	<u>1\1</u>
>Bits Allocated	(0028,0100)	M/M	16	<u>16</u>
>Bits Stored	(0028,0101)	M/M	12	<u>12</u>
>High Bit	(0028,0102)	M/M	11	<u>11</u>
>Pixel Representation	(0028,0103)	M/M	0	<u>0</u>
>Pixel Data	(7FE0,0010)	M/M		

#### 2.1.2.2.4 Printer

Printer: N-Get				
Attribute Name	Tag	Usage Scu/scp	Valid Range	Default
Printer Status	(2110,0010)	U/M	NORMAL, WARNING, FAILURE	-
Printer Status Info	(2110,0020)	U/M	SUPPLY EMPTY, SUPPLY LOW, RECEIVER FULL, FILM JAM	-
Printer Name	(2110,0030)	U/M		

### **2.1.3 Association Acceptance**

The X-Console does not accept associations.

## **3 Network Communication**

### **3.1 Supported Communication Stacks**

The X-Console system provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard (PS 3.8 Network Communication Support for Message Exchange).

### **3.2 OSI Stack**

No OSI Stack communications are provided.

### **3.3 TCP/IP Stack**

The X-Console system supports the TCP/IP stack.

### **3.4 Physical media support**

The X-Console system is indifferent to the physical medium over which TCP/IP executes.

### **3.5 Point-to-Point Stack**

No Point-to-Point Stack communications are provided.

## **4 Extensions/Specializations/Privatizations**

N/A.

## **5 Configuration**

The following parameters may be configured at the X-Console:

- Local SCU AE
- PACS SCP (Multiple): AE, Host IP and port
- Film Printer SCP (Multiple): AE, Host IP and port