

eFilm

DICOM Conformance Statement

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Revision 11



1.	INTRODUCTION	4
1.1.	Scope and Field of Application	4
1.2.	References and Definitions.....	4
1.3.	Symbols and Abbreviations	4
1.4.	Revision Number	5
1.5.	Considerations	6
2.	IMPLEMENTATION MODEL	7
2.1.	Application Data Flow Diagram	7
2.2.	Functional Definitions of Application Entities.....	8
2.3.	Sequencing of Real World Activities.....	8
3.	APPLICATION ENTITY SPECIFICATIONS	9
3.1.	AE Specifications for eFilm DICOM Services.....	9
3.1.1.	Association Establishment Policies	11
3.1.1.1.	General	11
3.1.1.2.	Number of Associations.....	11
3.1.1.3.	Asynchronous Nature	11
3.1.1.4.	Implementation Identifying Information.....	11
3.1.2.	Association Initiation Policy.....	12
3.1.2.1.	Verify Communication with a Remote System	12
3.1.2.1.1.	Associated Real World Activity	12
3.1.2.1.2.	Proposed Presentation Contexts.....	12
3.1.2.1.3.	SOP Specific Conformance Statement for SOP Verification Class.....	12
3.1.2.2.	Send Images to a Remote System.....	12
3.1.2.2.1.	Associated Real World Activity	12
3.1.2.2.2.	Proposed Presentation Contexts.....	13
3.1.2.2.3.	SOP Specific Conformance Statement for SOP Image Storage Class.....	13
3.1.2.3.	Query a Remote Database.....	15
3.1.2.3.1.	Associated Real World Activity	15
3.1.2.3.2.	Proposed Presentation Contexts.....	15
3.1.2.3.3.	SOP Specific Conformance Statement for SOP Query Class.....	15
3.1.2.4.	Retrieve from a Remote System	17
3.1.2.4.1.	Associated Real World Activity	17
3.1.2.4.2.	Proposed Presentation Contexts.....	17
3.1.2.4.3.	SOP Specific Conformance Statement for SOP Retrieve Class	17
3.1.2.5.	Print to a Remote Laser Imager.....	17
3.1.2.5.1.	Associated Real World Activity	17
3.1.2.5.2.	Proposed Presentation Contexts.....	17
3.1.2.5.3.	SOP Specific Conformance Statement for SOP Classes Basic Grayscale Print Management Meta Classes	18
3.1.2.5.3.1.	Conformance for SOP Class Basic Film Session.....	18
3.1.2.5.3.2.	Conformance for SOP Class Basic Film Box	18
3.1.2.5.3.3.	Conformance for SOP Class Basic Grayscale Image Box.....	19
3.1.2.5.3.4.	Conformance for SOP Class Printer.....	19
3.1.2.5.4.	Optional SOP Classes for Basic Grayscale Print Management Meta	19
3.1.2.6.	Retrieve a Modality Worklist from a Remote System	20
3.1.2.6.1.	Associated Real World Activity	20
3.1.2.6.2.	Proposed Presentation Context.....	20
3.1.2.6.3.	SOP Specific Conformance Statement for the Modality Worklist Management Class	20
3.1.2.7.	Verify the Committed Storage of Images on a Remote System.....	21
3.1.3.	Association Acceptance Policy	21
3.1.3.1.	Verify Communication with a Remote System	22
3.1.3.1.1.	Associated Real World Activity	22
3.1.3.1.2.	Accepted Presentation Contexts	22

3.1.3.1.3.	SOP Specific Conformance Statement for SOP Verification Class.....	22
3.1.3.1.4.	Presentation Context Acceptance Criterion.....	22
3.1.3.2.	Receive Images from a Remote System	22
3.1.3.2.1.	Associated Real World Activity	22
3.1.3.2.2.	Accepted Presentation Contexts	23
3.1.3.2.3.	SOP Specific Conformance Statement for SOP Storage Class.....	23
3.1.3.2.4.	Presentation Context Acceptance Criterion.....	24
3.1.3.3.	Query the eFilm Database.....	24
3.1.3.3.1.	Associated Real World Activity	24
3.1.3.3.2.	Accepted Presentation Contexts	24
3.1.3.3.3.	SOP Specific Conformance Statement for SOP Query Class.....	24
3.1.3.3.4.	Presentation Context Acceptance Criterion.....	25
3.1.3.4.	Retrieve from eFilm	26
3.1.3.4.1.	Associated Real World Activity	26
3.1.3.4.2.	Accepted Presentation Contexts	26
3.1.3.4.3.	SOP Specific Conformance Statement for SOP Retrieve Class	26
3.1.3.4.4.	Presentation Context Acceptance Criterion.....	26
3.1.4.	eFilm DICOM Media Services	Error! Bookmark not defined.
3.1.4.1.	Real World Activity: Display Directory of CD-R Disk ..	Error! Bookmark not defined.
3.1.4.2.	Real World Activity: Read Images from CD-R Disk....	Error! Bookmark not defined.
3.1.4.3.	Real World Activity: Write Images	Error! Bookmark not defined.
4.	COMMUNICATION PROFILE	29
4.1.	Supported Communication Stacks	29
4.2.	OSI Stack.....	29
4.3.	TCP/IP Stack	29
4.3.1.	Physical Media Support	29
4.4.	Point-to-Point Stack	29
5.	EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS ...	30
5.1.	Standard Extended/Specialized/Private SOPs.....	30
5.2.	Private Transfer Syntaxes	30
6.	CONFIGURATION	31
6.1.	AE Title/Presentation Address Mapping.....	31
6.2.	Configuration Parameters.....	31
7.	SUPPORT OF EXTENDED CHARACTER SETS.....	32

1. INTRODUCTION

1.1. Scope and Field of Application

This document is the DICOM Conformance Statement for the eFilm medical imaging software application developed by Merge Healthcare. Contained in this statement are detailed descriptions of how eFilm collaborates with other Medical Imaging devices and applications that conform to the DICOM 3.0 standard.

The intended user of this document is involved with software design and system integration. It is understood that this individual is familiar with the concepts and terms used throughout this document. Readers unfamiliar with the DICOM 3.0 standard should consult the actual documentation prior to examining this conformance statement.

1.2. References and Definitions

All necessary references and definitions have been taken from the Digital Imaging and Communications in Medicine (DICOM) standard, parts 1 through 13 (NEMA PS 3.1-13).

1.3. Symbols and Abbreviations

All symbols and abbreviations used herein are described in the Digital Imaging and Communications in Medicine (DICOM) standard, parts 1 through 13 (NEMAPS 3.1-13).

1.4. Revision Number

Version	Date	Description
Rev 0	May 17, 2001	<ul style="list-style-type: none"> • First Release
Rev 1	July 3, 2001	<ul style="list-style-type: none"> • Implementation Version String is now eFilm
Rev 2	Nov 07/2001	<ul style="list-style-type: none"> • Included support of Verification Class as SCU • Included the following transfer syntaxes: <ul style="list-style-type: none"> • Explicit VR, JPEG Baseline (Process 1) • Explicit VR, JPEG Baseline (Process 4) • Explicit VR, JPEG Lossless, NH, FOP (Process 14)
Rev 3	Dec 18/2001	<ul style="list-style-type: none"> • 3.1.2.1. Included Verification as a Association Initiation Policy
Rev 4	May 09/2002	<ul style="list-style-type: none"> • 3.1. Included support of PET Storage SOP classes as SCU & SCP
Rev 5	May 17, 2002	<ul style="list-style-type: none"> • 3.1. Included support for Modality Worklist Management as SCU • 3.1.2.6. Included Retrieve a Modality Worklist from a Remote System as an association initiation policy.
Rev 6	June 14/2002	<ul style="list-style-type: none"> • 3.1.3.2.3 Included C-STORE response codes
Rev 7	Nov 01/2002	<ul style="list-style-type: none"> • Changed corporate name to Merge eFilm and included part number.
Rev 8	Aug 25/2003	<ul style="list-style-type: none"> • Minor revisions for eFilm 1.9 <ul style="list-style-type: none"> • Added FSC role for DICOMDIR creation • Other minor clarifications and additions
Rev 9	Nov 24/2003	Revisions for eFilm v2.0 Revised FSC role in the DICOMDIR creation Revised C-STORE SCP section
Rev 10	Sep 22/2005	Revisions for company name, and eFilm Workstation 2.1 Added support for RT Image Storage
Rev 11	Sep 10/2007	<ul style="list-style-type: none"> • Revisions for eFilm v3.0 • Implemented MergeCOM3 version 3.7 • Included the following transfer syntaxes: <ol style="list-style-type: none"> 1.Explicit VR, JPEG 2000 Lossless only 2.Explicit VR, JPEG 2000 3.Implicit VR, Little Endian • Included decompressing transfer syntax RLE into Explicit VR, Little Endian for C-MOVE.

1.5. Considerations

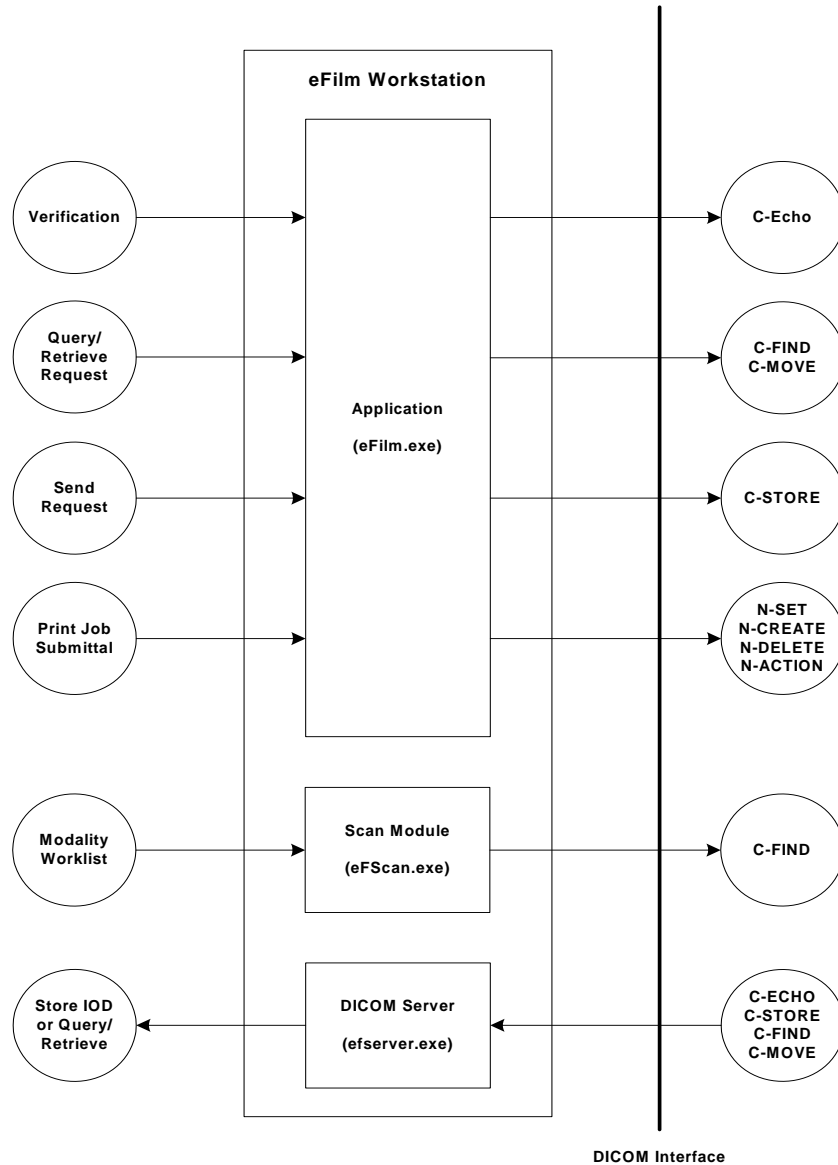
Readers should note the following points:

- This document on its own should not be interpreted as a guarantee of connectivity between eFilm and any equipment and/or applications offered by other vendors.
- Integration of eFilm with the equipment and/or applications of different vendors, including Merge Healthcare, are outside the scope of the DICOM 3.0 standard and product conformance statements. Integration and interoperability of different equipment/applications are the sole responsibility of the user.
- In the case of any possible connectivity inferred by a user to exist between eFilm and another product, the user is responsible for testing and verifying the inferred connectivity.
- Future changes to the DICOM 3.0 standard may require alterations to be made to eFilm. Merge Healthcare reserves the right to modify the eFilm architecture as needed, in order to meet changing standards.
- The user should ensure that any existing DICOM equipment also changes with the future developments of the DICOM standards. Failure to keep pace with any alterations in the DICOM standards may result in decreased or lost connectivity.
- All trade names mentioned in this document are recognized.

2. IMPLEMENTATION MODEL

2.1. Application Data Flow Diagram

The Implementation Model for the eFilm DICOM services is depicted below:



A number of eFilm's DICOM services are provided by the eFilm DICOM Server, which runs as a service (Windows NT/2000/XP Professional). The eFilm DICOM Server starts when the system is started, and shuts down when the system is turned off. In addition, basic query/retrieve requests and print job submittals can be made by eFilm directly between SCU and SCP devices without being routed through the DICOM Server process. This structure means that data

requests can be accepted at all times when the system is running, regardless of whether or not the Workstation application is open. In addition, if the DICOM Server should be interrupted or manually shut down for some reason, queries and print submittals can still be made.

eFilm will retrieve a Modality Worklist from a Remote System only when the eFilm™ Scan™ module is activated. If the eFilm Scan module is not active, it cannot retrieve a Modality Worklist from a remote system.

The eFilm DICOM Server supports image reception as well as the processing of query/retrieve requests.

2.2. Functional Definitions of Application Entities

All communications and image transfer with the remote application is accomplished utilizing the DICOM protocol over a network using the TCP/IP protocol stack.

Below is a table of the functions supported by eFilm application entities:

SCU	SCP
<ul style="list-style-type: none"> • Verification • Storage • Query/Retrieve • Basic Grayscale Print Management. • Modality Worklist Management 	<ul style="list-style-type: none"> • Verification • Storage • Query/Retrieve

2.3. Sequencing of Real World Activities

Not applicable.

3. APPLICATION ENTITY SPECIFICATIONS

3.1. AE Specifications for eFilm DICOM Services

The eFilm DICOM services provide support for the following DICOM 3.0 SOP Classes as an SCU:

SOP Classes as SCU	
SOP Class UID	SOP Class Name
Verification	
1.2.840.10008.1.1	Verification
Storage	
1.2.840.10008.5.1.4.1.1.1	CR Image Storage
1.2.840.10008.5.1.4.1.1.2	CT Image Storage
1.2.840.10008.5.1.4.1.1.1.1	DX Image Storage (Presentation)
1.2.840.10008.5.1.4.1.1.1.1.1	DX Image Storage (Raw)
1.2.840.10008.5.1.4.1.1.4	MR Image Storage
1.2.840.10008.5.1.4.1.1.6	US Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.6.1	US Image Storage
1.2.840.10008.5.1.4.1.1.3	US Multi-Frame Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.3.1	US Multi-Frame Image Storage
1.2.840.10008.5.1.4.1.1.7	SC Image Storage
1.2.840.10008.5.1.4.1.1.1.2	MG Storage (Presentation)
1.2.840.10008.5.1.4.1.1.1.2.1	MG Storage (Raw)
1.2.840.10008.5.1.4.1.1.5	NM Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.20	NM Image Storage
1.2.840.10008.5.1.4.1.1.12.1	XA Image Storage
1.2.840.10008.5.1.4.1.1.12.2	RF Image Storage
1.2.840.10008.5.1.4.1.1.12.3	XA Biplane Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.128	Standard PET Image Storage
1.2.840.10008.5.1.4.1.1.481.1	RT Image Storage
Query/Retrieve	
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Model – FIND
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Model – MOVE
1.2.840.10008.5.1.4.1.2.3.1	Patient/Study Only Query/Retrieve Information Model - FIND
1.2.840.10008.5.1.4.1.2.3.2	Patient/Study Only Query/Retrieve Information Model - MOVE
Print Management	
1.2.840.10008.5.1.1.9	Basic Grayscale Print Management
Modality Worklist Management	
1.2.840.10008.5.1.4.31	Modality Worklist Information Model-FIND ¹

¹ Proposed only if the eFilm™ Scan™ module is activated.

The eFilm DICOM services provide support for the following DICOM 3.0 SOP Classes as an SCP:

SOP Classes as SCP	
SOP Class UID	SOP Class Name
Verification	
1.2.840.10008.1.1	Verification
Storage	
1.2.840.10008.5.1.4.1.1.1	CR Image Storage
1.2.840.10008.5.1.4.1.1.2	CT Image Storage
1.2.840.10008.5.1.4.1.1.1.1	DX Image Storage (Presentation)
1.2.840.10008.5.1.4.1.1.1.1.1	DX Image Storage (Raw)
1.2.840.10008.5.1.4.1.1.4	MR Image Storage
1.2.840.10008.5.1.4.1.1.6	US Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.6.1	US Image Storage
1.2.840.10008.5.1.4.1.1.3	US Multi-Frame Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.3.1	US Multi-Frame Image Storage
1.2.840.10008.5.1.4.1.1.7	SC Image Storage
1.2.840.10008.5.1.4.1.1.1.2	MG Storage (Presentation)
1.2.840.10008.5.1.4.1.1.1.2.1	MG Storage (Raw)
1.2.840.10008.5.1.4.1.1.5	NM Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.20	NM Image Storage
1.2.840.10008.5.1.4.1.1.12.1	XA Image Storage
1.2.840.10008.5.1.4.1.1.12.2	RF Image Storage
1.2.840.10008.5.1.4.1.1.12.3	XA Biplane Image Storage (Retired)
1.2.840.10008.5.1.4.1.1.128	Standard PET Image Storage
1.2.840.10008.5.1.4.1.1.481.1	RT Image Storage
Query/Retrieve	
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Model - FIND
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Model - MOVE
1.2.840.10008.5.1.4.1.2.3.1	Patient/Study Only Query/Retrieve Information Model - FIND
1.2.840.10008.5.1.4.1.2.3.2	Patient/Study Only Query/Retrieve Information Model - MOVE
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model - FIND
1.2.840.10008.5.1.4.1.2.1.2	Patient Root Query/Retrieve Information Model - MOVE

3.1.1. Association Establishment Policies

3.1.1.1. General

The DICOM Application Context Name (ACN) that is always proposed by the eFilm DICOM services is 1.2.840.10008.3.1.1. The services shall offer a maximum PDU size of 16kB (16384 bytes) upon association initiation, and accept maximum PDU sizes up to 16kB (16384 bytes) on associations initiated by remote applications. There is no limit on the number of Presentation Context Items that will be proposed.

3.1.1.2. Number of Associations

eFilm can support multiple associations simultaneously, both as an SCP and as an SCU. As an SCP, the DICOM Server will listen for incoming associations and spawn a new thread to manage each request. This ability means it is possible for eFilm to receive both images and query/retrieve requests from multiple SCUs simultaneously. By default, the maximum number of simultaneous associations is limited to 25. Users may increase this value as needed; however, one should expect performance to degrade if the maximum number of simultaneous associations is increased significantly beyond 25.

As an SCU, eFilm DICOM Server can send images to multiple SCPs simultaneously, spawning a new thread for each destination if the number of sending threads does not exceed 25. For DICOM print jobs, eFilm establishes associations serially.

3.1.1.3. Asynchronous Nature

eFilm does not support asynchronous operations. All operations will be performed synchronously.

3.1.1.4. Implementation Identifying Information

The Implementation Class UID is: 1.2.804.114118.3.
The Implementation Version String is: eFilm.

3.1.2. Association Initiation Policy

eFilm initiates associations for the following activities:

- DICOM communication verification between eFilm and a remote system.
- Sending images from the local eFilm database to a remote system.
- Queries of remote database contents.
- Retrieval of images from a remote database to the local eFilm database.
- Print images.
- Retrieve a Modality Worklist from a Remote System.

3.1.2.1. Verify Communication with a Remote System

3.1.2.1.1. Associated Real World Activity

The user selects a server from the list of Remote Devices in the Edit->Properties page, and clicks "Verify".

3.1.2.1.2. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	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		

3.1.2.1.3. SOP Specific Conformance Statement for SOP Verification Class

eFilm provides standard conformance for DICOM communication verification.

3.1.2.2. Send Images to a Remote System

3.1.2.2.1. Associated Real World Activity

The user selects one or more studies from the search dialog and clicks the Send button. A list of AEs appears, from which the user selects one.

3.1.2.2.2. Proposed Presentation Contexts

Presentation Context Table for Send to Remote System				
Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	See Below	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	See Below	SCU	None
DX Image Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.1	See Below	SCU	None
DX Image Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.1.1	See Below	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	See Below	SCU	None
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	See Below	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See Below	SCU	None
US Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	See Below	SCU	None
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See Below	SCU	None
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	See Below	SCU	None
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2	See Below	SCU	None
MG Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.2.1	See Below	SCU	None
NM Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	See Below	SCU	None
NM Image Storage	1.2.840.10008.5.1.4.1.1.20	See Below	SCU	None
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	See Below	SCU	None
XA Biplane Image Storage(Retired)	1.2.840.10008.5.1.4.1.1.12.3	See Below	SCU	None
RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2	See Below	SCU	None
Standard PET Image Storage	1.2.840.10008.5.1.4.1.1.128	See Below	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	See Below	SCU	None

Transfer Syntaxes for Send To Remote System	
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, JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50 ²
Explicit VR, JPEG Baseline (Process 4)	1.2.840.10008.1.2.4.51 ²
Explicit VR, JPEG Lossless, NH,FOP (Process 14)	1.2.840.10008.1.2.4.70 ²
RLE Lossless	1.2.840.10008.1.2.5 ²
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90 ²
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91 ²

3.1.2.2.3. SOP Specific Conformance Statement for SOP Image Storage Class

Images stored in the eFilm database that are to be sent to remote systems are converted to instances of the corresponding SOP Storage class(es). Images are then sent sequentially to the remote system(s). When sending multiple images to one remote system, a new association is negotiated for each study. eFilm will propose the transfer syntax of the stored SOP instance, and the default, Implicit VR, Little Endian (ILE). That is, if the SOP instance is stored using a compressed syntax, eFilm has the ability to decompress it into the ILE syntax for receivers that

² Only if the image is already stored in specified syntax, and proposed in addition to ILE.

cannot process compressed images.

Query a Remote Database

3.1.2.2.4. Associated Real World Activity

The user clicks on the Remote exams list in the Search dialogue, selects an AE from the list of destinations, enters the search criteria, and then clicks Search. “Begins with” searching is used, allowing partial search criteria to be entered. As some SCPs do not accept wildcard searching in the Patient ID field and/or do not support the query of the modality key at the Study level, such options can be enabled/disabled as needed through eFilm’s Edit Properties page.

3.1.2.2.5. Proposed Presentation Contexts

Presentation Context Table for Remote Database Query					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	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		

3.1.2.2.6. SOP Specific Conformance Statement for SOP Query Class

eFilm supports C-Find response values as defined in DICOM v.3.0 Part 4. All Required (R) and Unique (U) Study, Series, and Image level keys are supported for the Study Root information models. In addition, certain Optional (O) keys are supported. For a Study Root Query/Retrieve the following keys are supported:

Study Root Query/Retrieve: Supported Keys			
Data Level	Description	Tag	Type
Study	Study Date	(0008,0020)	R
Study	Study Time	(0008,0030)	R
Study	Study Accession Number	(0008,0050)	R
Study	Patient’s Name	(0010,0010)	R
Study	Patient ID	(0010,0020)	R
Study	Study ID	(0020,0010)	R
Study	Study Instance UID	(0020,000D)	U
Study	Study Referring MD’s Name	(0008,0090)	O
Study	Study Description	(0008,1030)	O
Study	Patient’s Birth Date	(0010,0030)	O
Study	Patient’s Sex	(0010,0040)	O
Study	Institutional Department Name	(0008,1040)	O
Series	Series Description	(0008,103E)	O
Series	Series Modality	(0008,0060)	R
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Number of Series Related Instances	(0020,1209)	O
Image	Image Number	(0020,0013)	R

Image	Image SOP Instance UID	(0008,0018)	U
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3.1.2.3. Retrieve from a Remote System

3.1.2.3.1. Associated Real World Activity

The user selects one or more studies from the Remote Exams list in the Search dialogue, then clicks either View or Retrieve.

3.1.2.3.2. Proposed Presentation Contexts

Presentation Context Table for Remote Database Retrieve					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.3.3. SOP Specific Conformance Statement for SOP Retrieve Class

eFilm provides standard conformance.

3.1.2.4. Print to a Remote Laser Imager

3.1.2.4.1. Associated Real World Activity

The user selects the desired image(s) by clicking on the lower right-hand square of each image and then selects DICOM Print from the File menu. He or she selects the appropriate printer, makes any necessary changes to the printer settings, and then clicks Print.

3.1.2.4.2. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Basic Grayscale Print Management	1.2.840.1000.8.5.1.1.9	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.4.3. SOP Specific Conformance Statement for the SOP Classes of the Basic Grayscale Print Management Meta SOP Class

Below (following page) are the mandatory print SOP classes supported by eFilm for the Basic Grayscale Management Meta class.

Basic Grayscale Print Management Meta Class: Supported SOP Classes	
SOP Class Name	SOP Class 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

3.1.2.4.3.1. Conformance for SOP Class Basic Film Session

eFilm includes the following N-Create attributes for the Basic Film Session SOP class:

Basic Film Session SOP class N-CREATE: Attributes	
Description	Tag
Number of Copies	(2000,0010)
Print Priority	(2000,0020)
Medium Type	(2000,0030)
Film Destination	(2000,0040)
Film Session Label	(2000,0050)
Memory Allocation	(2000,0060)

N-Set and N-Action are not used; however, N-Delete is used to delete the complete Basic Film Session SOP instance hierarchy.

3.1.2.4.3.2. Conformance for SOP Class Basic Film Box

The table below lists the N-Create attributes for the Basic Film Box SOP class, where A means the attribute is always sent and C means the attribute is only sent when not empty.

Basic Film Box SOP class N-CREATE: Attributes		
Description	Tag	Usage
Print Priority	(2000,0020)	C
Image Display Format	(2010,0010)	C
Referenced Film Session Sequence	(2010,0500)	A
> Referenced SOP Class UID	(0008,1150)	A
> Referenced SOP Instance UID	(0008,1155)	A
Film Orientation	(2010,0040)	C
Film Size ID	(2010,0050)	C
Magnification Type	(2010,0060)	A
Maximum Density	(2010,0130)	C
Configuration Information	(2010,0150)	A
Smoothing Type	(2010,0080)	C
Border Density	(2010,0100)	C
Empty Image Density	(2010,0110)	C
Minimum Density	(2010,0120)	C
Trim	(2010,0140)	C

The N-Set is currently unused; however, the N-Action is used to print a complete Basic Film Box SOP instance and N-Delete is used to delete it after printing.

3.1.2.4.3.3. Conformance for SOP Class Basic Grayscale Image Box

The following attributes are included in eFilm's N-Set for the Basic Grayscale Image SOP class. Again, "A" stands for attributes which are always sent to the printer, while "C" stands for attributes that are only sent when they contain data.

Basic Grayscale Image SOP Box: N-Set Attributes		
Description	Tag	Usage
Image Position	(2020,0010)	A
Preformatted Grayscale Image Sequence	(2020,0110)	A
Requested Image Size	(2020,0030)	C ³
> Samples Per Pixel	(0028,0002)	A
> Photometric Interpretation	(0028,0004)	A
> Rows	(0028,0010)	A
> Columns	(0028,0011)	A
> Pixel Aspect Ratio	(0028,0034)	A
> Bits Allocated	(0028,0100)	A
> Bits Stored	(0028,0101)	A
> High Bit	(0028,0102)	A
> Pixel Representation	(0028,0103)	A
> Pixel Data	(7FE0,0010)	A
Requested Decimate/Crop Behaviour	(2020,0040)	C ³
Magnification Type	(2010,0060)	A
Smoothing Type	(2010,0080)	A
Polarity	(2020,0020)	A

Please note that eFilm only supports 8-bit printing.

3.1.2.4.3.4. Conformance for SOP Class Printer

eFilm uses N-GET for the Printer SOP class to get information from the SCP.

3.1.2.4.4. Optional SOP Classes for Basic Grayscale Print Management Meta

These SOP classes are not yet supported by eFilm.

³ Sent only the in case of "expected size" printing.

3.1.2.5. Retrieve a Modality Worklist from a Remote System

3.1.2.5.1. Associated Real World Activity

eFilm can query for a Modality Worklist to aid in merging patient demographics into DICOM images. This prevents the need to enter patient demographics manually. This feature is available only when the eFilm™ Scan™ module is activated.

3.1.2.5.2. Proposed Presentation Context

Presentation Context Table for Modality Worklist Management					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Worklist Information Model-FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.1008.1.2	SCU	None

3.1.2.5.3. SOP Specific Conformance Statement for the Modality Worklist Management Class

eFilm provides standard conformance, a list of supported keys is given in the table below:

Modality Worklist Management: Supported Keys			
Module	Description	Tag	Type
Scheduled Procedure Step	Schedule Procedure Step Sequence	(0040,0100)	R
	> Scheduled Station AE Title	(0040,0001)	R
	> Scheduled Procedure Step Start Date	(0040,0002)	R
	> Scheduled Procedure Step Start Time	(0040,0003)	R
	> Modality	(0008,0060)	R
	> Scheduled Performing Physician	(0040,0006)	R
	> Scheduled Procedure Step Description	(0040,0007)	O
	> Scheduled Station Name	(0040,0010)	O
	> Scheduled Procedure Step Location	(0040,0011)	O
	> Pre-Medication	(0040,0012)	O
	> Scheduled Procedure Step ID	(0040,0009)	O
> Requested Contrast Agent	(0032,1070)	O	
Requested Procedure	Requested Procedure ID	(0040,1001)	O
	Requested Procedure Description	(0032,1060)	O
	Study Instance UID	(0020,000D)	O
	Requested Procedure Priority	(0040,1003)	O
	Patient Transport Arrangements	(0040,1004)	O
Imaging Service Request	Accession Number	(0008,0050)	O
	Requesting Physician	(0032,1032)	O
	Referring Physician's Name	(0008,0090)	O
	Study ID Status	(0032,000A)	O
	Study Priority ID	(0032,000C)	O
Visit Identification	Admission ID	(0038,0010)	O

Modality Worklist Management: Supported Keys			
Module	Description	Tag	Type
Visit Status	Current Patient Location	(0038,0300)	O
Patient Identification	Patient's Name	(0010,0010)	R
	Patient ID	(0010,0020)	R
	Issuer of Patient ID	(0010,0021)	O
	Other Patient ID's	(0010,1000)	O
	Other Patient Names	(0010,1001)	O
	Patient's Birth Name	(0010,1005)	O
	Patient's Mother's Birth Name	(0010,1060)	O
	Medical Record Locator	(0010,1090)	O
Patient Demographic	Patient's Birth Date	(0010,0030)	O
	Patient's Birth Time	(0010,0032)	O
	Patient's Sex	(0010,0040)	O
	Patient's Size	(0010,1020)	O
	Patient's Weight	(0010,1030)	O
	Patient's Address	(0010,1040)	O
	Military Rank	(0010,1080)	O
	Branch of Service	(0010,1081)	O
	Country of Residence	(0010,2150)	O
	Region of Residence	(0010,2152)	O
	Patient's Telephone Numbers	(0010,2154)	O
	Ethnic Group	(0010,2160)	O
	Patients Religious Preference	(0010,21F0)	O
	Patient Comments	(0010,4000)	O
	Patient Medical	Medical Alerts	(0010,2000)
Contrast Allergies		(0010,2110)	O
Pregnancy Status		(0010,21C0)	O
Special Needs		(0038,0050)	O
Patient State		(0038,0500)	O

eFilm may fill, none, one or multiple attributes in the query request with a non-empty value. eFilm may thus request matching on Optional Matching Key Attributes.

All fields listed above are always included in the query request to ask the SCP to return them for each response. eFilm expects the SCP to return values for all 'R' attributes whereas the attributes marked with 'O' may be optionally filled. Therefore eFilm treats these attributes as Type 3 Return Key Attributes.

3.1.2.6. Verify the Committed Storage of Images on a Remote System

eFilm does not yet support this function.

3.1.3. Association Acceptance Policy

eFilm accepts associations for the activities listed below:

- DICOM communication verification between eFilm and a remote system.

- Image transfer from a remote system to eFilm.
- Processing remote system queries.
- Initiation of image transfer to a remote system in response to a request for retrieval.

eFilm will reject association requests from unknown AEs that request an image transfer. Similarly, most remote systems will reject eFilm's association requests if the eFilm AE title is not correctly configured.

3.1.3.1. Verify Communication with a Remote System

3.1.3.1.1. Associated Real World Activity

eFilm will send an echo response to verification requests made by remote systems.

3.1.3.1.2. Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	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		

3.1.3.1.3. SOP Specific Conformance Statement for SOP Verification Class

eFilm provides standard conformance for DICOM communication verification.

3.1.3.1.4. Presentation Context Acceptance Criterion

eFilm will accept all presentation contexts which match those of the preceding table (above). No specific acceptance and/or prioritization rules are required.

3.1.3.2. Receive Images from a Remote System

3.1.3.2.1. Associated Real World Activity

A remote system pushes (i.e., sends) images to eFilm. Upon completion of the transfer, the images are available locally and can be selected for display.

3.1.3.2.2. Accepted Presentation Contexts

Presentation Context Table for Receive from a Remote System				
Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	See Below	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	See Below	SCP	None
DX Image Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.1	See Below	SCP	None
DX Image Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.1.1	See Below	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	See Below	SCP	None
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	See Below	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See Below	SCP	None
US Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	See Below	SCP	None
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See Below	SCP	None
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	See Below	SCP	None
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2	See Below	SCP	None
MG Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.2.1	See Below	SCP	None
NM Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	See Below	SCP	None
NM Image Storage	1.2.840.10008.5.1.4.1.1.20	See Below	SCP	None
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	See Below	SCP	None
XA Biplane Image Storage(Retired)	1.2.840.10008.5.1.4.1.1.12.3	See Below	SCP	None
RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2	See Below	SCP	None
Standard PET Image Storage	1.2.840.10008.5.1.4.1.1.128	See Below	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	See Below	SCP	None

Transfer Syntaxes for Receive from Remote System	
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, JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
Explicit VR, JPEG Baseline (Process 4)	1.2.840.10008.1.2.4.51
Explicit VR, JPEG Lossless, NH,FOP (Process 14)	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91

3.1.3.2.3. SOP Specific Conformance Statement for SOP Storage Class

The eFilm AE conforms to the SOP's of the Storage SOP Class at Level 2 (full). No elements are discarded or coerced by the eFilm AE. In the case of a successful C-STORE operation the object has successfully been written to disk in the eFilm database. If an image is sent with the same SOP Instance UID (0008, 0018) as one that already exists on the eFilm AE, the new image will replace the old image and the database will be updated accordingly.

Lossy JPEG images will be stored in compressed form when received by eFilm and will only be uncompressed for viewing.

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

C-STORE RESPONSE CODES			
Service Status	Status Description	Status Code (0000,0900)	Related Fields
Error	Invalid dataset.	A900	None
Error	Processing failure.	0110	None
Success	Success	0000	None

3.1.3.2.4. Presentation Context Acceptance Criterion

No criterion.

3.1.3.3. Query the eFilm Database

3.1.3.3.1. Associated Real World Activity

A remote system queries the eFilm database to determine what studies are present on the system.

3.1.3.3.2. Accepted Presentation Contexts

Presentation Context Table for Remote Query of the Local eFilm Database					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	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		

3.1.3.3.3. SOP Specific Conformance Statement for SOP Query Class

eFilm supports C-Find response values as defined in DICOM v.3.0 Part 4. All Required (R) and Unique (U) Study, Series, and Image level keys are supported for the Study Root information models. In addition, certain Optional (O) keys are supported. The following tables outline the supported keys. Please note that eFilm does not support relational queries.

Study Root Query/Retrieve: Supported Keys			
Level	Description	Tag	Type
Patient	SOP Class UID	(0008,0016)	O
Patient	Patient Name	(0010,0010)	R
Patient	Patient ID	(0010,0020)	U
Patient	Patient Date of Birth	(0010,0030)	O
Patient	Patient Sex	(0010,0040)	O
Study	SOP Class UID	(0008,0016)	O

Study	Study Date	(0008,0020)	R
Study	Study Time	(0008,0030)	R
Study	Study Accession Number	(0008,0050)	R
Study	Study ID	(0020,0010)	R
Study	Study Instance UID	(0020,000D)	U
Study	Study Referring MD's Name	(0008,0090)	O
Study	Study Description	(0008,1030)	O
Study	Series Modality	(0008,0060)	R
Series	SOP Class UID	(0008,0016)	O
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Number of Series Related Instances	(0020,1209)	O
Image	SOP Class UID	(0008,0016)	O
Image	Image Number	(0020,0013)	R
Image	Image SOP Instance UID	(0008,0018)	U

In addition, eFilm also supports the following types of attribute matching:

- Single Value Matching
- Universal Matching
- Wild Card Matching
- Range Matching

3.1.3.3.4. Presentation Context Acceptance Criterion

eFilm will accept all presentation contexts which match those of the preceding table (above, preceding page). No specific acceptance and/or prioritization rules are required.

3.1.3.4. Retrieve from eFilm

3.1.3.4.1. Associated Real World Activity

A remote system retrieves one or more studies from the eFilm system.

3.1.3.4.2. Accepted Presentation Contexts

Presentation Context Table for Remote Retrieve from the Local eFilm Database					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Study Root Query Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.4.3. SOP Specific Conformance Statement for SOP Retrieve Class

eFilm provides standard conformance.

In addition, eFilm implements relational retrieve. In other words, all studies from a single patient can be retrieved by entering a single patient ID for the Study Root Query/Retrieve Model.

3.1.3.4.4. Presentation Context Acceptance Criterion

eFilm will only accept requests for retrieval from those systems to which the application has been properly configured, with respect to Application Entity title, IP address or hostname, and DICOM port number.

3.1.4. eFilm Workstation DICOM Media Services

eFilm Workstation conforms to DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles (PS 3.11) for reading images on CD-Recordable media.

The following application profile is supported by eFilm Workstation:

Supported Application Profile	
Description	Identifier
General Purpose CD-R Image Interchange Profile	STD-GEN-CD

eFilm Workstation, through its supported application profile (above), supports the real world activities listed below. Please note that some additional flexibility is also available.

Real World Activities		
Real World Activity	Role	SC Option
Display Directory of CD-R disk	FSR	Interchange
Read Image(s) from CD-R disk	FSR	Interchange

3.1.4.1. Real World Activity: Display Directory of CD-R Disk

eFilm Workstation assumes the role of FSR when reading the CD-R disk directory. Reading this directory will display an overview of the patients, studies, and images, organized in one of these ways:

Type of Query	
Type of Query	Levels
Study Root Query	Study

The user must supply at minimum the data for the Patient Name and Patient ID fields in order to display correctly the directory information. Reading the DICOMDIR contents is a standard feature in eFilm Workstation. The following DICOMDIR keys are used for distinguishing between the objects.

DICOMDIR Keys Displayed by eFilm Workstation			
Query Type	Level	Field	Tag
Study Root	Study	Patient Name	(0010,0010)
Study Root	Study	Patient ID	(0010,0020)
Study Root	Study	Modality	(0008,0060)
Study Root	Study	Study ID	(0020,0010)
Study Root	Study	Study Instance UID	(0020,000D)
Study Root	Study	Study Description	(0008,1030)

3.1.4.2. Real World Activity: Read Images from CD-R Disk

When reading images from a CD-R, eFilm Workstation will assume the role of FSR. DICOM Part 10 Volume image import is standard.

In order for eFilm Workstation to store the images contained on a CD-R correctly, the following mandatory DICOM image attributes (DICOM Part 10) are required:

Mandatory Keys: DICOM Part 10 File Import		
IOD	Field	Tag
Patient	Patient Name	(0010,0010)
Patient	Patient ID	(0010,0020)
Study	Study ID	(0020,0010)
Study	Study UID	(0020,000D)
Series	Modality	(0008,0060)
Series	Series Number	(0020,0011)
Image	Referenced SOP Class UID in File	(0004,1510)
Image	Referenced SOP Instance UID in File	(0004,1511)
Image	Referenced Transfer Syntax UID in File	(0004,1512)
Image	Referenced File ID	(0004,1500)
Image	Image Number	(0020,0013)

eFilm Workstation can only import and read images from the following SOP classes:

Supported SOP Classes: DICOM Part 10 Import	
Name	UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
DX Image Storage	1.2.840.10008.5.1.4.1.1.1.1

(Presentation)	
DX Image Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.1.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
US Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2
MG Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.2.1
NM Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XA Biplane Image Storage(Retired)	1.2.840.10008.5.1.4.1.1.12.3
RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Standard PET Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1

The following transfer syntaxes are supported by eFilm Workstation when importing and reading CD-R images:

Supported Transfer Syntaxes: DICOM Part 10 Import	
Name	UID
Explicit VR, Little Endian	1.2.840.10008.1.2.1

3.1.4.3. Image Export for CD-R Recording

eFilm fully supports the General Purpose CD-R Image Interchange Profile as a File Set Creator, when the *DICOMDIR* “packager” is selected. If the *DICOMDIR with eFilm Lite* packager is selected, the resultant CD-R will be fully compliant, except for the file system used; Joliet extensions will be used to accommodate long file names that are part of the eFilm Lite software.

Multi-session writes are not supported.

The associated real world activity that initiates export of images for CD-R recording is: The user selects a study from the Study Manager, and selects “Burn to Media”.

3.1.4.4. The Legacy Packagers

The file set created through the legacy packagers do not conform to the General Purpose CD-R Image Interchange Profile as a File Set Creator, but notably, they will copy the files from the local database as-is, rather than converting them to the Explicit VR, Little Endian transfer syntax.

4. COMMUNICATION PROFILE

4.1. Supported Communication Stacks

DICOM Part 8 is supported by eFilm through TCP/IP.

4.2. OSI Stack

OSI stack is not supported by eFilm.

4.3. TCP/IP Stack

The TCP/IP stack supported by eFilm is inherited from the host operating system (Windows 95/98/NT/2000/XP Professional).

4.3.1. Physical Media Support

Any Windows 95/98/NT/2000/XP Professional supported physical media.

4.4. Point-to-Point Stack

eFilm does not support 50-pin ACR-NEMA connection.

5. EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

5.1. Standard Extended/Specialized/Private SOPs

Not applicable.

5.2. Private Transfer Syntaxes

Not applicable.

6. CONFIGURATION

Local AE titles are configurable.

6.1. AE Title/Presentation Address Mapping

The local AE title can be configured by authorized personnel. Such personnel may change configurations through the settings of the Process Manager.

6.2. Configuration Parameters

The following fields are configurable for the local AE:

- Local AE Title
- Listening TCP/IP Port (default port is 4006)
- Number of simultaneous connections

The following fields are configurable for any remote AE:

- Remote AE
- Remote TCP/IP Port
- Remote IP Address

7. SUPPORT OF EXTENDED CHARACTER SETS

eFilm supports the use of the Japanese Character Repertoire, Unicode and Simplified Chinese in the applicable Value Representations, such as Patient's Name, Study Description and Series Description.