



eFilm Workstation®

4.3

**DICOM CONFORMANCE STATEMENT**

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#### **INDICATIONS FOR USE:**

eFilm Workstation with Modules is a software application that is used for viewing medical images.

eFilm Workstation with Modules receives digital images and data from various sources (including but not limited to CT, MR, US, RF units, computed and direct radiographic devices, secondary capture devices, scanners, imaging gateways or imaging sources).

eFilm Workstation with Modules can be used to communicate, process and display medical images.

Users have access to various image processing and measurement tools to assist them in viewing images. In addition, users can overlay templates on medical images to aid in preoperative planning.


eFilm Workstation with Modules can be integrated with an institution’s existing HIS or RIS for a fully integrated electronic patient record.

**CANADIAN DEVICE IDENTIFIER:** EFILM 01



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The symbols glossary is provided electronically at <https://developer.ibm.com/watsonhealth/ibm-merge-statements-and-patches/>

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- <https://estore.merge.com/na/eFilmCommunity/index.aspx>

Part	Date	Revision	Description
EFW-863	November 2013	1.0	Initial version
	October 2015	2.0	Updated template
	November 2016	3.0	Updated template
	March 2018	4.0	Updated copyright page
	June 2020	5.0	Updated template

The latest revision of this document can be found in <https://estore.merge.com/na/eFilmCommunity/index.aspx>.



# DICOM Conformance Statement

## Intended Audience

The user of this document is involved with system integration and/or software design. We assume that the reader is familiar with the terminology and concepts that are used in the DICOM 3.0 Standards.

## 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).

## 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 (NEMA PS 3.1-13).

## Purpose of this Document

This document is the DICOM Conformance Statement for the DICOM services of eFilm Workstation.

Its purpose is to specify compliance with the DICOM standard on the following eFilm Workstation supported service classes:

- Verification Service Class as SCU and SCP.
- Storage Service Class as SCU and SCP.
- Study Root Query/Retrieve Information Model - FIND as an SCU.
- Study Root Query/Retrieve Information Model - MOVE as an SCU.
- DICOM Basic Greyscale Print Management as an SCU.

## Considerations

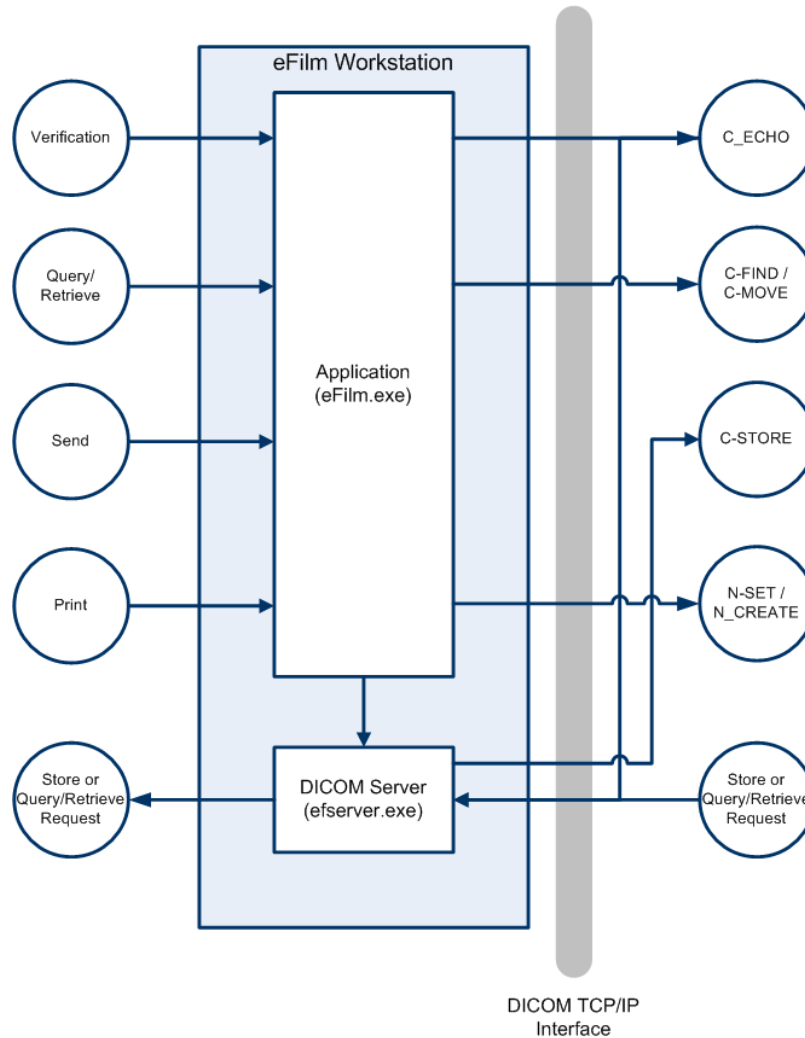
Readers should note the following points:

- 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.

# Implementation Model

## 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 Windows service. The eFilm DICOM Server starts when the system is started, and shuts down when the system is turned off. In addition, verification, basic query/retrieve requests and print job submittals may 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.

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

## 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
Verification	Verification
Storage	Storage
Query/Retrieve	Query/Retrieve
Basic Grayscale Print Management	

### Verification SCU/SCP

eFilm Workstation Verification SCU/SCP are implemented for testing the availability of external DICOM devices and for answering similar testing queries from external DICOM devices. The DICOM C-Echo Service is used to provide the service.

As an SCU eFilm Workstation executes the following operations:

- 1 Initiates a DICOM association to send the request.
- 2 Issues a C-ECHO request.
- 3 Waits for the response.
- 4 If failed, the failure is reported to the user

As SCP eFilm Workstation executes the following operations:

- 1 Listens for a DICOM association request.
- 2 Remote entity issues a C-ECHO request.
- 3 eFilm Workstation issues a C-ECHO response.

## Storage SCU/SCP

eFilm Workstation Storage SCU/SCP are implemented as application entities for sending and receiving DICOM objects.

As an SCU, eFilm Workstation Storage executes the following operations:

- 1 Open a DICOM association request to the remote device.
- 2 Issues the C-STORE request.
- 3 Receives the C-STORE response.

As an SCP eFilm Workstation Storage executes the following operations:

- 1 Listens for a DICOM association request.
- 2 Accepts a C-STORE request.
- 3 Receives the DICOM conformant SOP Instance with the demographic information and pixel data.
- 4 If the SOP Instance is correctly received, stores it in a predefined directory.
- 5 Sends a final response for the operation with success or failure status.
- 6 Listens for DICOM association release.

## Query SCU/SCP

eFilm Workstation Query SCU/SCP are implemented as application entities for querying a Query SCP about the existence, in its database, of SOP Instances corresponding to some filtering criteria and responding to similar requests from other devices.

As an SCU eFilm Workstation Storage executes the following operations:

- 1 Initiates a DICOM association to request the Query Operation.
- 2 Prepares the C- FIND request with the requested filtering criteria (the query attributes)
- 3 Sends the C- FIND request to the Query SCP.
- 4 Waits for and accepts all the responses to the C- FIND request.
- 5 Closes the Association.
- 6 Makes the received responses available to the local application and display for further use.



As an SCP eFilm Workstation Storage executes the following operations:

- 1 Listens for a DICOM association request.
- 2 Accepts a C-FIND request.
- 3 Prepares and sends the DICOM conformant response(s).
- 4 Sends a final response for the operation with success or failure status.
- 5 Listens for DICOM association release.

## Retrieve SCU/SCP

eFilm Workstation Retrieve SCU/SCP are implemented as an application entities for moving a SOP Instances to/from DICOM destinations. The DICOM C-MOVE Service of the Query/Retrieve Service Class is used to command the Retrieve operation.

eFilm Workstation as a Retrieve SCU executes the following operations:

- 1 Initiates a DICOM association to request the Retrieve Operation.
- 2 Prepares the C-MOVE request with the requested MOVE attributes to retrieve the images.
- 3 Sends the C-MOVE request to the Retrieve SCP and performs Storage SCP to receive the images.

Reception of the DICOM objects utilizes the Storage Application Entity.

- 4 Waits for the acknowledgement of completion of the Retrieve Operation (may be OK or fail).

Reception of the DICOM objects utilizes the Storage Application Entity.

- 5 Closes the Association.

eFilm Workstation as a Retrieve SCP executes the following operations:

- 1 Waits for a DICOM association that will request the Retrieve Operation.
- 2 Receives the C-MOVE request with the requested MOVE attributes to retrieve the images.
- 3 Sends the C-MOVE responses to the Retrieve SCU and uses the Storage SCU to send the objects.
- 4 Sends the final C-MOVE response of completion of the Retrieve Operation (may be OK or fail).
- 5 Wait for additional associations.

## Basic Grayscale Print Management SCU

eFilm Workstation Basic Grayscale Print Management SCU is implemented as an application entities for printing a SOP Instances to DICOM destinations.

As an SCU eFilm Workstation Storage executes the following operations:

- 1 Open a DICOM association request the remote device.
- 2 Issues the Normalized (N-xxxx) requests to implement the printing of the DICOM objects.
- 3 Receives the N-xxxx responses.

## Application Entity Specifications

### Supported DICOM Services

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

SOP Classes		
SOP Class UID	SOP Class Name	Role
Verification		
1.2.840.10008.1.1	Verification	SCU/SCP
Storage		
1.2.840.10008.5.1.4.1.1.1	Computed Radiography Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.1	Digital X-Ray Image Storage - For Presentation	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.1.1	Digital X-Ray Image Storage - For Processing	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography X-Ray Image Storage - For Presentation	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.2.1	Digital Mammography X-Ray Image Storage - For Processing	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.3	Digital Intra-oral X-Ray Image Storage - For Presentation	SCU/SCP
1.2.840.10008.5.1.4.1.1.1.3.1	Digital Intra-oral X-Ray Image Storage - For Procession	SCU/SCP
1.2.840.10008.5.1.4.1.1.10	Standalone Modality LUT Storage (Retired)	SCU/SCP

1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.11	Standalone VOI LUT Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.11.1	Grayscale Softcopy Presentation State Storage SOP Class	SCU/SCP
1.2.840.10008.5.1.4.1.1.11.2	Color Softcopy Presentation State Storage SOP Class	SCU/SCP
1.2.840.10008.5.1.4.1.1.11.3	Pseudo-Color Softcopy	SCU/SCP
1.2.840.10008.5.1.4.1.1.11.4	Blending Softcopy Presentation State Storage SOP Class	SCU/SCP
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.12.1.1	Enhanced XA Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.12.2	X-Ray Radiofluoroscopic Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.12.2.1	Enhanced XRF Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.12.3	X-Ray Angiographic Bi-Plane Image Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.128	Positron Emission Tomography Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.129	Standalone PET Curve Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.2	CT Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.2.1	Enhanced CT Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.20	Nuclear Medicine Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.3	Ultrasound Multi-frame Image Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.4	MR Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.4.1	Enhanced MR Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.4.2	MR Spectroscopy Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.1	RT Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.2	RT Dose Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.3	RT Structure Set Storage	SCU/SCP

1.2.840.10008.5.1.4.1.1.481.4	RT Beams Treatment Record Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.5	RT Plan Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.6	RT Brachy Treatment Record Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.7	RT Treatment Summary Record Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.8	RT Ion Plan Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.481.9	RT Ion Beams Treatment Record Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.5	Nuclear Medicine Image Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.6	Ultrasound Image Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.66	Raw Data Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.66.1	Spatial Registration Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.66.2	Spatial Fiducials Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.66.3	Deformable Spatial Registration Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.66.4	Segmentation Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.67	Real World Value Mapping Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.7.1	Multi-frame Single Bit Secondary Capture Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.7.2	Multi-frame Grayscale Byte Capture Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.7.3	Multi-frame Grayscale Word	SCU/SCP
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.1	VL Endoscopic Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.2	VL Microscopic Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.4	VL Photographic Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic Photography 8 Bit Image Storage	SCU/SCP

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1.2.840.10008.5.1.4.1.1.77.1.5.2	Ophthalmic Photography 16 Bit Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.5.3	Stereometric Relationship Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.77.1.6	VL Whole Slide Microscopy Image Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.8	Standalone Overlay Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.11	Basic Text SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.33	Comprehensive SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.40	Procedure Log Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.50	Mammography CAD SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.59	Key Object Selection Document Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.65	Chest CAD SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.88.67	X-Ray Radiation Dose SR Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9	Standalone Curve Storage (Retired)	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.1.1	12-lead ECG Waveform Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.1.2	General ECG Waveform Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.1.3	Ambulatory ECG Waveform Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.2.1	Hemodynamic Waveform Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.3.1	Cardiac Electrophysiology Waveform Storage	SCU/SCP
1.2.840.10008.5.1.4.1.1.9.4.1	Basic Voice Audio Waveform Storage	SCU/SCP

Query/Retrieve		
1.2.840.10008.5.1.4.1.2.3.1	Patient/Study Only Query/Retrieve Information Model - FIND (Retired)	SCP
1.2.840.10008.5.1.4.1.2.3.2	Patient/Study Only Query/Retrieve Information Model - MOVE (Retired)	SCP
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model - FIND	SCU/SCP
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Information Model - MOVE	SCU/SCP
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model - FIND	SCP
1.2.840.10008.5.1.4.1.2.1.2	Patient Root Query/Retrieve Information Model - MOVE	SCP

Print Management		
1.2.840.10008.5.1.1.9	Basic Grayscale Print Management xx Meta SOP Class	SCU

## Association Establishment Policies

### 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.

## 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 process (a server "child") 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 can send images to multiple SCPs simultaneously, spawning a new thread for each destination. For DICOM print jobs, eFilm establishes associations serially.

## Asynchronous Nature

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

## Implementation Identifying Information

The Implementation Class UID is: 1.2.804.114118.3.

The Implementation Version String is: eFilm.

## 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.

## Verify Communication with a Remote System

### Associated Real World Activity

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

### Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	1 Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

### SOP Specific Conformance Statement for SOP Verification Class

eFilm provides standard conformance for DICOM communication verification.

## Send Images to a Remote System

### Associated Real World Activity

The user selects one or more studies from the search dialog and clicks the Send button. A list of configured devices appears, from which the user can select. The user may specify that the objects should be compressed and/or anonymized for this transfer.

eFilm can also Auto-Route images to a destination. If an object received or generated locally matches the configured rule, a storage task will be queued for the object. After a configurable amount of time if no new objects in the same series are received eFilm will send the objects to the destination(s) configured in the routing rule.

If a study is edited, eFilm Workstation can be configured re-apply the routing rules and trigger the resending of the objects to the destination(s) configured in the routing rule.

### Proposed Presentation Contexts

The list of proposed presentation contexts is generated based on the items selected to be transferred.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Any Storage SOP Class identified in the Supported SOP Class Section of this Document under “Storage”	See Supported SOP Class Table	See generation rules below.	See generation rules below.	SCU	None



## **Transfer Syntax Generation Rules**

The transfer syntaxes proposed are generated for each SOP class. If compressed images are in the set to be transferred, then the appropriate lossless or lossy syntax are included. Additionally, if the Bit Depth and Photometric Interpretation are compatible with the transfer syntax (e.g. limitation on JPEG Hierarchical Lossless Process 14) then the syntax is included in the list of proposed transfer syntaxes. RLE-compressed images are the only exception in which case eFilm will only propose the RLE Lossless syntax when sending.

## **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 cannot process compressed images. RLE-compressed images are the only exception in which case eFilm will only propose the RLE Lossless syntax when sending.

## **Query a Remote System**

### **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.

### Proposed Presentation Contexts

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

### SOP Specific Conformance Statement for SOP Query Class

eFilm supports C-Find request 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

Study Root Query/Retrieve: Supported Keys			
Data Level	Description	Tag	Type
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Number of Series Related Instances	(0020,1209)	O
Image	Instance Number	(0020,0013)	R
Image	SOP Instance UID	(0008,0018)	U

## Retrieve from a Remote System

### Associated Real World Activity

The user clicks on the Remote exams list in the Search dialogue. After querying the remote device, the user selects a line or lines from the list and click either "View" or "Retrieve".

### Proposed Presentation Contexts

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

### 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

## Print to a Remote System

### 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.

### Proposed Presentation Contexts

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

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

Below 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

### 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.

### 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.

## 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 Film Box SOP class N-CREATE: Attributes		
Description	Tag	Usage
Image Position	(2020,0010)	A
Preformatted Grayscale Image Sequence	(2020,0110)	A
Requested Image Size	(2020,0030)	C*
> 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 Behavior	(2020,0040)	C*
Magnification Type	(2010,0060)	A
Smoothing Type	(2010,0080)	A
Polarity	(2020,0020)	A

\*Sent only in the case of "expected size" printing.

Please note that eFilm only supports 8-bit printing.

## Conformance for SOP Class Printer

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

## Optional SOP Classes for Basic Grayscale Print Management Meta

These SOP classes are not yet supported by eFilm.

## Association Acceptance Policy

### General

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.

## Verify Communication with a Remote System

### Associated Real World Activity

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

### Accepted Presentation Contexts

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

### SOP Specific Conformance Statement for SOP Verification Class

eFilm provides standard conformance for DICOM communication verification.

### 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.

## Receive Images from a Remote System

### 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.



### Accepted Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Any Storage SOP Class identified in the Supported SOP Class Section of this Document under "Storage	"See Supported SOP Class Table	Implicit VR, Little Endian	1.2.840.100 08.1.2	SCP	None
		Explicit VR, JPEG Baseline (Process 1)	1.2.840.100 08.1.2.4.50	SCP	
		Explicit VR, JPEG Baseline (Process 4)	1.2.840.100 08.1.2.4.51	SCP	
		Explicit VR, JPEG Lossless, NH,FOP (Process 14)	1.2.840.100 08.1.2.4.70	SCP	
		RLE Lossless	1.2.840.100 08.1.2.5	SCP	

### 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:

Service Status	Status Description	Status Code (0000,0900)	Related Fields
Error	Cannot understand: The message was not properly DICOM encoded, or the SOP class unrecognized. The request was not processed.	C010	None
Success	Success	0000	None

## Presentation Context Acceptance Criterion

No criterion.

## Query the eFilm Database

### Associated Real World Activity

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

### 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

### 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			
Data Level	Description	Tag	Type
Patient	SOP Class UID	(0018,0016)	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	(0018,0016)	O

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	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	(0018,0016)	O
Series	Series Instance UID	(0020,000E)	R
Series	Series Number	(0020,0011)	R
Series	Number of Series Related Instances	(0020,1209)	O
Image	Instance Number	(0020,0013)	R
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

### **Presentation Context Acceptance Criterion**

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

## **Retrieve from eFilm**

### **Associated Real World Activity**

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

## 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 - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

### SOP Specific Conformance Statement for SOP Query 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.

### 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.

## 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 Images(s) from CD-R disk	FSR	Interchange

### 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)