IDEXX **Cornerstone***
Practice Management System

DICOM® Conformance Statement
for IDEXX Cornerstone Practice Management System with the Diagnostic Imaging Module

IDEXX
LABORATORIES

Proprietary Rights Notice

IDEXX
LABORATORIES

One IDEXX Drive
Westbrook, Maine 04092 USA
idexx.com/cornerstone

Contents

1. Introduction

1.1 Scope and Field of Application

This DICOM® Conformance Statement covers IDEXX DICOM Services used in combination with the Digital Imaging Module of IDEXX Cornerstone* Practice Management System. This statement describes how the Cornerstone software communicates with DICOM 3.0–compatible devices.

This document was written with the understanding that the reader will be familiar with the concepts and terms of the DICOM 3.0 standard.

1.1.1 Key Information for Setting up DICOM Modality Worklist Connections

If you want to set up a DICOM Modality Worklist (MWL) connection between the Cornerstone software and an imaging device, the following sections will be of particular interest:

- 3.3.3 Receive Images from a Remote System
- 3.3.9 Query a specified SCP for MWL entries and send to specified SCP the status of Modality Performed Procedure Steps
- 3.3.10 Provide SCP Response to SCU MWL Request
- 3.3.11 Receive Status of MPPS

1.2 References and Definitions

All references and definitions have been taken from the Digital Imaging and Communications in Medicine (DICOM) standard, parts 3.1 through 3.13, published by the National Electrical Manufacturers Association (available online at dicom.nema.org).

Acronyms and Initialisms

AE   Application Entity

CR   Computed Radiography

CT   Computed Tomography

DICOM   Digital Imaging and Communications in Medicine

DIMSE   DICOM Message Service Element

DX   Digital X-ray

FOP   First-Order Prediction

IP   Internet Protocol

JPEG   Joint Photographic Experts Group

LUT   Lookup Table

MPPS   Modality Performed Procedure Step

MR   Magnetic Resonance

MWL   Modality Worklist

NEMA   National Electrical Manufacturers Association

NH   Non-Hierarchical

NM   Nuclear Medicine

PDU	Protocol Data Unit
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
US	Ultrasound
VR	Value Representation
XA	X-ray Angiography

2. Implementation Model

2.1 Application Data Flow Diagram

The implementation model for the IDEXX DICOM Services is shown in figure 2-1:

The IDEXX DICOM Services are installed as a system service. The IDEXX DICOM server starts when the system is started and shuts down when the system is turned off. IDEXX Cornerstone* Practice Management System provides the user interface to interact with the DICOM Services.

2.2 Functional Definitions of Application Entities

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

Cornerstone software supports the following DICOM services:

- Verification (SCU/SCP)
- Storage (SCU/SCP)
- Basic Grayscale Print (SCU)
- Query/Retrieve (SCU/SCP)
- Modality Worklist (SCU/SCP)

2.3 Sequencing of Real-World Activities

Not applicable.
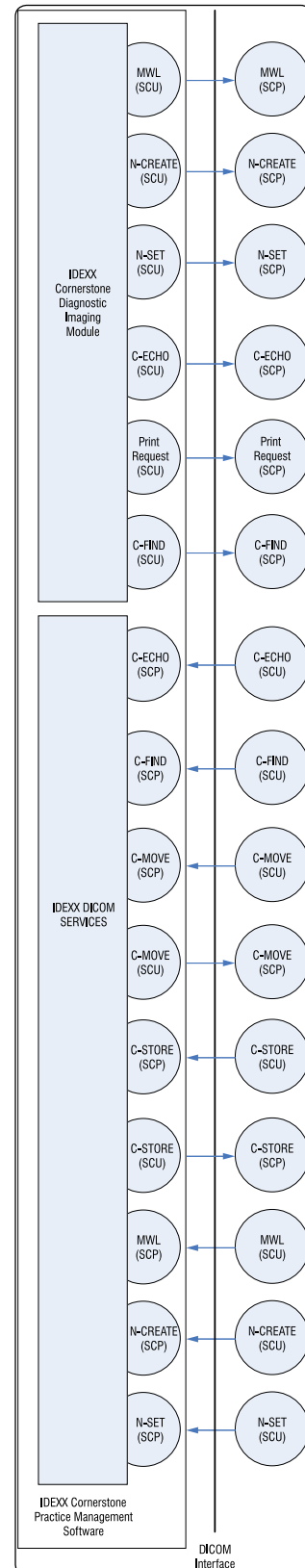
Figure 2-1: Application Data Flow Diagram

3. AE Specifications

3.1 AE Specifications for IDEXX DICOM Services

The IDEXX DICOM Services provide support for DICOM® 3.0 SOP Classes as shown in table 3-1.

Table 3-1. Supported DICOM 3.0 SOP Classes

SOP Class	UID	Service Role
Verification	1.2.840.10008.1.1	SCP and SCU
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	SCP and SCU
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	SCP and SCU
USMF Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	SCP and SCU
USMF Image Storage	1.2.840.10008.5.1.4.1.1.3.1	SCP and SCU
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	SCP and SCU
NM Image Storage	1.2.840.10008.5.1.4.1.1.5	SCP and SCU
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	SCP and SCU
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	SCP and SCU
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	SCP and SCU
DX Image Storage—For Presentation	1.2.840.10008.5.1.4.1.1.1.1	SCP and SCU
DX Image Storage—For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	SCP and SCU
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	SCP and SCU
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	SCP and SCU
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	SCU
MWL Information Model	1.2.840.10008.5.1.4.31	SCU
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	SCU

3.2 Association Establishment Policies

3.2.1 General

The IDEXX DICOM Services, acting in the service role of SCU, can initiate associations to send images using the C-STORE service using configurable association parameters Called-AE-Title, Calling-AE-Title, and remote IP address.

IDEXX DICOM Services can also act in the role of SCP and respond by either accepting or rejecting associations. Associations are accepted when the association request is valid—when it includes the correct application context, correct DICOM version, and when the Called-AE-Title, Calling-AE-Title, and remote (calling) IP address are all recognized, based on the configuration. Associations are rejected when these conditions are not met.

The maximum PDU size requested or accepted by the IDEXX AE is configurable. The default size is 16,384.

3.2.2 Number of Associations

The IDEXX AE supports multiple associations (both accepted and requested). The default number of associations is set at 50.

3.2.3 Asynchronous Nature

Asynchronous operations are not supported by this version of the AE.

3.2.4 Implementation-Identifying Information

The Implementation Class UID is: 1.2.40.0.13.1.1

The Implementation Version String is: dcm4che-IDX-1.0

3.3 Association Initiation by Real-World Activity

3.3.1 Verify Communication with a Remote System

3.3.1.1 Associated Real-World Activity

At the Remote Servers Configuration window, the user selects a server from the Remote Servers list and clicks Test Server. The SCP function listens for the C-ECHO request.

3.3.1.2 Proposed Presentation Contexts

Table 3-2. Presentation Contexts for Verifying Communication with Remote System

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP and SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP and SCU	None

3.3.1.3 SOP-Specific Conformance Statement for SOP Verification Class

The IDEXX Cornerstone* Practice Management System provides standard conformance for DICOM communication verification.

Note: Any remote system requesting a verification response needs to be configured in order to receive a response.

3.3.2 Send Images to a Remote System

3.3.2.1 Associated Real-World Activity

On the Image Explorer window, the user selects one or more images and clicks Send DICOM. On the Image Viewer window, the user selects the thumbnail for an image, right-clicks, selects Send To and Send DICOM. On the case window, the user selects a case containing images, then clicks Send via DICOM. In all three scenarios, a list of remote AEs appears, from which the user selects one or more. The system uses the default DICOM file format to select the desired presentation context. See the *IDEXX Cornerstone Diagnostic Imaging User's Guide* and other user documentation and training material for additional details.

3.3.2.2 Proposed Presentation Contexts

Table 3-3. Presentation Contexts for Verifying Communication with Remote System

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
CR Image Storage	1.2.840.10008. 5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
CT Image Storage	1.2.840.10008. 5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
USMF Image Storage (Retired)	1.2.840.10008. 5.1.4.1.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
USMF Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
MR Image Storage	1.2.840.10008. 5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH,FOP (Process 14)	1.2.840.10008.1.2.4.70		
NM Image Storage	1.2.840.10008. 5.1.4.1.1.5	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Image Storage (Retired)	1.2.840.10008. 5.1.4.1.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Image Storage	1.2.840.10008. 5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
SC Image Storage	1.2.840.10008. 5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
DX Image Storage— for Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
DX Image Storage— for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

3.3.2.3 SOP-Specific Conformance Statement for SOP Image Storage Class

The images are converted to the specified instances of the corresponding SOP Storage class(es) prior to being sent. The images are then sent sequentially to the remote system(s). When sending multiple images to a single remote system, a new association is negotiated for each image.

3.3.3 Receive Images from a Remote System

3.3.3.1 Associated Real-World Activity

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

3.3.3.2 Accepted Presentation Contexts

Table 3-4. Accepted Presentation Context for Receiving from a Remote System

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
CR Image Storage	1.2.840.10008. 5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
CT Image Storage	1.2.840.10008. 5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
USMF Image Storage (Retired)	1.2.840.10008. 5.1.4.1.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
USMF Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
MR Image Storage	1.2.840.10008. 5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
NM Image Storage	1.2.840.10008. 5.1.4.1.1.5	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Image Storage (Retired)	1.2.840.10008. 5.1.4.1.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Image Storage	1.2.840.10008. 5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
SC Image Storage	1.2.840.10008. 5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
DX Image Storage— for Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
DX Image Storage— for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
US Multi- Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Lossless, NH, FOP (Process 14)	1.2.840.10008.1.2.4.70		

The Cornerstone software conforms to the SOPs of the Storage SOP Class at Level 2 (full). No elements are discarded or coerced by the IDEXX AE. In the case of a successful C-STORE operation, the object has successfully been written to disk in the database for Cornerstone. If an image is received with the same SOP Instance UID (0008, 0018) as one that already exists, the new image will be ignored and no error message will be provided.

3.3.4 Initiate Query Request

3.3.4.1 Associated Real-World Activity

On the Image Explorer window, with the Advanced Search tab selected, the user selects the remote server in the Location text box, enters search criteria, and clicks the Search button. The Cornerstone software initiates a query request (C-FIND) at the study level via the Query Retrieve Level attribute (0008,0052), using a value of STUDY.

3.3.4.2 Accepted Presentation Contexts

Table 3-5. Presentation Context Table for Initiating Query Request

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.3.5 Remote System Initiates Query Request

3.3.5.1 Associated Real-World Activity

A remote system initiates a query request using the C-FIND command. Cornerstone supports queries at the study, series, or image level via the Query Retrieve Level attribute (0008,0052), which can have a value of PATIENT, STUDY, SERIES, or IMAGE.

3.3.5.2 Accepted Presentation Contexts

Table 3-6. Presentation Context Table for Querying Request from Remote System

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.3.6 Initiate Retrieval Request

3.3.6.1 Associated Real-World Activity

Using the results of the process detailed in 3.3.4.1, the user selects one or more studies and clicks the Retrieve button.

Cornerstone initiates a retrieval request (C-MOVE) at the study level via the Query Retrieve Level attribute (0008,0052), using a value of STUDY.

3.3.6.2 Accepted Presentation Contexts

Table 3-7. Presentation Context Table for Initiating Retrieval Request

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.3.7 Remote System Initiates Retrieval Request

3.3.7.1 Associated Real-World Activity

A remote system initiates a retrieve request using the C-MOVE command. Cornerstone supports retrieval at the study, series, or image level via the Query Retrieve Level attribute (0008,0052), which can have a value of PATIENT, STUDY, SERIES, or IMAGE.

3.3.7.2 Accepted Presentation Contexts

Table 3-8. Presentation Context Table for Querying Request from Remote System

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.3.8 Print to a Remote Laser Imager

3.3.8.1 Associated Real-World Activity

The user selects the DICOM Print option from the File menu, drop-down menu, or button. The user is then allowed to select the appropriate DICOM printer and supporting image/printer settings. See the *IDEXX Cornerstone* Diagnostic Imaging User's Guide* and other user documentation and training material for additional details.

3.3.8.2 Proposed Presentation Contexts

Table 3-9. Presentation Context Table for Printing to a Remote Laser Imager

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	UID	Name List	UID List		
Grayscale Print Management	1.2.840.10008.5.1.1.9	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

3.3.8.3 SOP-Specific Conformance Statement for SOP Classes Used by the Basic Grayscale Print Management Meta SOP Class

Table 3-10. SOP Classes Supported for the Basic Grayscale Print Management Meta SOP Class

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
Optional: Print Job SOP Class	1.2.840.10008.5.1.1.14

The SCU can support the following attributes. Individual printer drivers may support a subset of these options.

Note: There are Print Job DICOM data elements not captured here but required to configure the printer connection. These include: AE Title, Host Name, and Port.

Table 3-11. Attributes supported by the SCU

Group/Element	Description	Supported Options
(0028,0002)	Samples per Pixel	
(0028,0004)	Photometric Interpretation	
(0028,0010)	Rows	
(0028,0011)	Columns	
(0028,0034)	Pixel Aspect Ratio	
(0028,0100)	Bits Allocated	
(0028,0101)	Bits Stored	
(0028,0102)	High Bit	
(0028,0103)	Pixel Representation	
(0028,0106)	Smallest Image Pixel Value	
(0028,0107)	Largest Image Pixel Value	
(0028,1050)	Window Center	
(0028,1051)	Window Width	
(0028,1052)	Rescale Intercept	

Group/Element	Description	Supported Options
(0028,1053)	Rescale Slope	
(0032,4000)	Study Comments	
(2000,0010)	Copies	
(2000,0020)	Priority	HIGH, MED, LOW
(2000,0030)	Medium Type	PAPER, CLEAR FILM, BLUE FILM
(2000,0040)	Film Destination	MAGAZINE, PROCESSOR, BIN_i
(2000,0050)	Film Session Label	
(2010,0010)	Image Display Format	STANDARD\1,1\2,2\3,3
(2010,0040)	Film Orientation	PORTRAIT, LANDSCAPE
(2010,0050)	Film Size	Display 8 in x 10 in 10 in x 12 in 10 in x 14 in 11 in x 14 in 14 in x 14 in 14 in x17 in 24 cm x 24 cm 24 cm x 30 cm
(2010,0060)	Magnification Type	REPLICATE, BILINEAR, CUBIC, NONE
(2010,0080)	Smoothing Type	SHARP, SMOOTH, MEDIUM
(2010,0100)	Border Density	BLACK, WHITE, 0-300
(2010,0110)	Empty Image Density	BLACK, WHITE, 0-300
(2010,0120)	Min Density	0-300
(2010,0130)	Max Density	0-300
(2010,0140)	Trim	YES, NO
	Presentation LUT Sequence	
	LUT Descriptor	
	LUT Explanation	
	LUT Data	
	Presentation LUT Shape	Identity
(2020,0020)	Polarity	NORMAL, REVERSE
(2010,0150)	Printer configuration table	CS000-CS999
(7FE0,0010)	Pixel Data	
(2110,0010)	Printer Status	NORMAL, WARNING, FAILURE
(2110,0020)	Printer Status Info	
(2100,0020)	Execution Status	PENDING, PRINTING, DONE, FAILURE

The system configuration allows the user to add parameters and values, with supporting defaults as necessary to support printer configurations.

The following table lists the N-CREATE attributes for the Basic Film and Image Box SOP class.

Table 3-12. N-CREATE Supported

Group/Element	Description
(0008,0008)	Image Type CS 1-n
(0008,0012)	Instance Creation Date DA 1
(0008,0013)	Instance Creation Time TM 1
(0008,0014)	Instance Creator UID UI 1
(0008,0016)	SOP Class UID UI 1
(0008,0018)	SOP Instance UID UI 1
(0008,0020)	Study Date DA 1
(0008,0021)	Series Date DA 1
(0008,0022)	Acquisition Date DA 1
(0008,002A)	Acquisition Datetime DT 1
(0008,0030)	Study Time TM 1
(0008,0031)	Series Time TM 1
(0008,0032)	Acquisition Time TM 1
(0008,0050)	Accession Number SH 1
(0008,0060)	Modality CS 1
(0008,0068)	Presentation Intent Type CS 1
(0008,0070)	Manufacturer LO 1
(0008,0080)	Institution Name LO 1
(0008,0081)	Institution Address ST 1
(0008,1030)	Study Description LO 1
(0008,1070)	Operators' Name PN 1-n
(0008,1090)	Manufacturer's Model Name LO 1
(0008,2111)	Derivation Description ST 1
(0008,2112)	Source Image Sequence SQ 1
(0010,0010)	Patient's Name PN 1
(0010,0020)	Patient ID LO 1
(0010,0030)	Patient's Birth Date DA 1
(0010,0040)	Patient's Sex CS 1
(0010,1010)	Patient's Age AS 1
(0010,1030)	Patient's Weight DS 1
(0018,0060)	KVP DS 1
(0018,1110)	Distance Source to Detector DS 1
(0018,1152)	Exposure IS 1
(0018,1402)	Cassette Orientation CS 1
(0018,1403)	Cassette Size CS 1
(0020,000D)	Study Instance UID UI 1
(0020,000E)	Series Instance UID UI 1
(0020,0010)	Study ID SH 1
(0020,0011)	Series Number IS 1
(0020,0013)	Instance Number IS 1
(0028,0002)	Samples per Pixel US 1
(0028,0004)	Photometric Interpretation CS 1

Group/Element	Description
(0028,0008)	Number of Frames IS 1
(0028,0010)	Rows US 1
(0028,0011)	Columns US 1
(0028,0030)	Pixel Spacing DS 2
(0028,0100)	Bits Allocated US 1
(0028,0101)	Bits Stored US 1
(0028,0102)	High Bit US 1
(0028,0103)	Pixel Representation US 1
(0028,1050)	Window Center DS 1-n
(0028,1051)	Window Width DS 1-n
(0040,1002)	Reason for the Requested Procedure LO 1
(0040,0270)	Scheduled Procedure Step Attributes Sequence
(0040,0009)	Scheduled Procedure Step ID
(2020,0020)	Polarity CS 1

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

The Print Job SOP Class (1.2.840.10008.5.1.1.14) is optional. If supported, it is used to monitor completion of the print job through the N-GET Service Group.

Table 3-13. N-SET Attributes for MWL Support

Group/Element	Description
(0008,0250)	Performed Procedure Step End Date
(0008,0252)	Performed Procedure Step Status
(0008,0054)	Retrieve AE Title
(0008,103E)	Series Description

3.3.9 Query a specified SCP for MWL entries and send MPPS status to a specified SCP

3.3.9.1 Associated Real-World Activity

This functionality is not currently available in Cornerstone.

3.3.10 Provide SCP Response to SCU MWL Request

3.3.10.0 Associated Real-World Activity

The Cornerstone system, acting in the role of SCP, can be queried by an SCU that to provide MWL entries.

3.3.10.2 Proposed Presentation Contexts

Table 3-15. Presentation Contexts for querying and sending to a specified SCP.

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
MWL Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.1008.1.2	SCP	None

3.3.11 Receive Status of MPPS

3.3.11.1 Associated Real-World Activity

On each status update, the SCU should send an MPPS update to the SCP. The Cornerstone system will update the MPPS accordingly.

3.3.11.2 Proposed Presentation Contexts

Table 3-16. Presentation Contexts for querying and sending to a specified SCP.

Abstract Syntax		Transfer Syntax		Service Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.1008.1.2	SCP	None

4. Communication Profiles

This section explains communication profiles supported by the IDEXX Cornerstone*
Practice Management System.

4.1 Supported Communication Stacks

TCP/IP is the only supported communication stack.

4.2 TCP/IP

The IDEXX AE provides TCP/IP support for network communication.

4.3 Physical Media Support

The physical media supported by the IDEXX AE is dependent on the network
hardware installed in the computer.

5. Extensions, Specialization, and Privatizations

5.1 Standard Extended/Specialized/Private SOPs

The following veterinary-specific tags, introduced in the 2007 version of the DICOM®
standard, are supported by the IDEXX Cornerstone* Practice Management System.

Table 5-1. Syntax Tags

Group/ Element	Description
(0010,2201)	Patient Species Description
(0010,2203)	Patient's Sex Neutered
(0010,2292)	Patient Breed Description
(0010,2297)	Responsible Person
(0010,2298)	Responsible Person Role
(0010,2299)	Responsible Organization

5.2 IDEXX DICOM Services Private Tags

The Cornerstone software implements private tags to support the needs of the
veterinary market. These tags support the breed, species, and owner requirements for
the veterinary market.

Table 5-2. Private Transfer Syntax Tags

Group/ Element	Description
(0011,1000)	Breed Name UN 1
(0011,1001)	Species Name UN 1
(0011,1002)	Owner UN 1

6. Support of Extended Character Sets

IDEXX DICOM Services support the receipt of Unicode character-set based images.

7. Codes and Controlled Terminology

Not applicable.

8. Security Profiles

Not applicable.

9. Configuration

9.1. Configuration Parameters

The following fields are configurable for the IDEXX AE:

- AE Title
- Port Number
- Image Repository
- Maximum Number of Clients
- Maximum PDU Length
- DIMSE Timeout
- Request Timeout
- Socket Close Delay

The following fields are configurable for any remote AE:

- Server Name
- AE Title
- IP Address
- Port Number
- Query/Retrieve Support Indicator

06-65881-00