ImageVision 5.0

DICOM Conformance Statement 1.0

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1 Introduction

1.1 Purpose

A DICOM Conformance Statement is intended to describe which components, optional components or extensions of the DICOM standard are supported by a particular implementation. The Conformance Statement of one implementation can be compared with the Conformance Statement from another implementation to determine which capabilities are commonly supported.

DICOM does not, by itself, guarantee interoperability. Furthermore, the identification of common capabilities by comparing DICOM Conformance Statements is also not sufficient to guarantee connectivity between two devices.

A DICOM Conformance Statement cannot replace validation and cross-vendor testing with other devices. Validation and cross-vendor testing are still required to ensure that both devices are performing as intended.

The reader should be aware of a number of important issues:

- Even when comparing this Conformance Statement with the Conformance Statement of another device indicates that connectivity is possible, the system integrator is responsible for carrying out test procedures to ensure that the required connectivity is actually met.
- Neither the DICOM Standard nor this Conformance Statement can ensure interoperability when integrating devices from different vendors. It is the system integrator's responsibility to ensure that the application requirements of all devices within the complete system are met.
- The DICOM standard undergoes continual review and improvement in order to meet changing requirements. Corrections, extensions and additional services are added from time to time. Medigration reserves the right to make changes to the product described in this conformance statement in order to cover changes in the DICOM standard. Readers should be aware that connected devices should also follow changes in the DICOM standard in order to retain connectivity.

The intended audience for this Conformance Statement is hospital technical staff, system integrators and software engineers. The reader is assumed to have good understanding of the DICOM standard.

1.2 Scope

This conformance statement describes the DICOM capabilities of the medigration ImageVision. The ImageVision is a diagnostic workstation for medical images. It is specifically designed to be integrated into a DICOM network environment containing Modalities and Archives from different vendors. It supports those DICOM services needed to receive images and other DCOs for display, to query the contents of an

DICOM archive, to send images or other DICOM DCOs to another DICOM device and to print images to a hardcopy device (e.g. film camera).

1.3 Definitions, Acronyms and Abbreviations

1.3.1 Definitions

System Integrator	A person or organization responsible for integrating devices into a new or existing system. The System Integrator takes responsibility for ensuring that the system works as a whole.

Other definitions can be found within the different parts of the DICOM standard [1].

1.3.2 Acronyms and Abbreviations

AE	**A**pplication **E**ntity
DCO	**D**ICOM **C**omposite **O**bject. A DICOM object such as an image, overlay, lookup-table, waveform, presentation state or radiotherapy plan which can be stored using the Storage Service Class.

Other acronyms and abbreviations used within this document are defined within the different parts of the DICOM standard [1].

1.4 References

[1] DICOM Public Standard 3.1-2016b, National Electrical Manufacturers Association, 1300 N. 17th Street Rosslyn, Virginia 22209, USA.

2 Implementation Model

The ImageVision is a device for the storage and display of DICOM Composite Objects (DCOs). The objects which can be stored include a wide variety of DICOM images (e.g. CT, MR, US, etc.) and other objects (e.g. presentation states, structured reports, print objects, radiotherapy objects, overlays, waveforms, look-up tables, etc.). The ImageVision software receives DCOs over a network interface, stores them on local magnetic disks and displays them on a monitor for diagnostic purpose. It is also capable of printing the images to a softcopy display and querying and retrieving DCOs from an archive. It maintains a database of summary information about stored objects and allows this database to be queried.

2.1 Application Data Flow Diagram

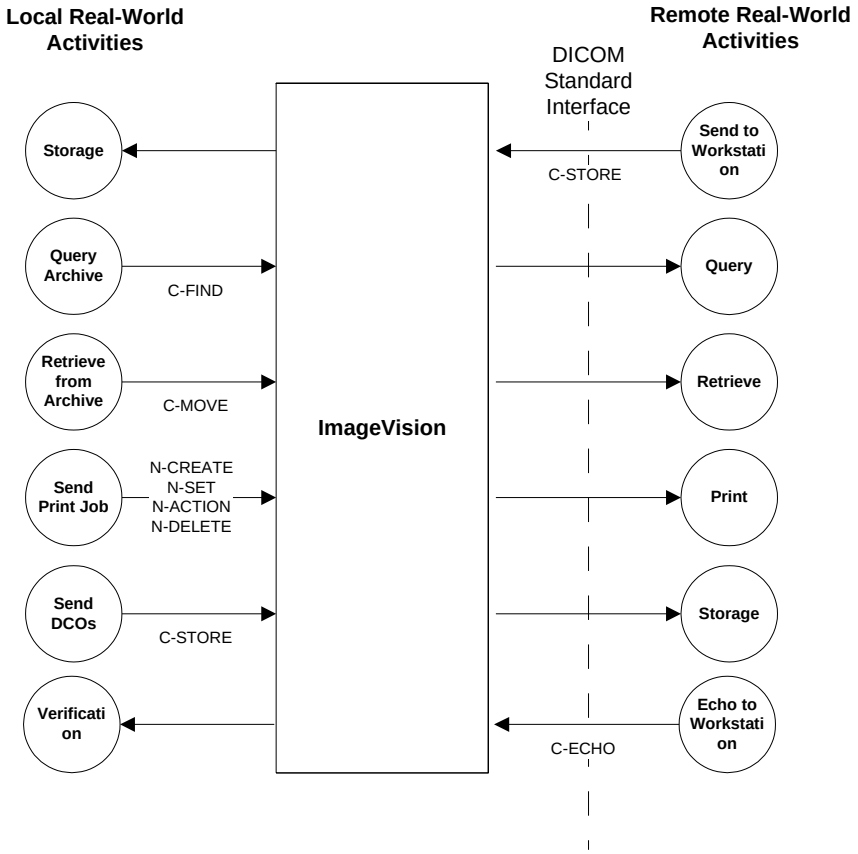

Figure 1: ImageVision Implementation Model

Figure 1 illustrates the relationships between the ImageVision Application Entity (AE) and its associated Real-World Activities. The **Remote Real-World Activities** are shown on the right and the **Local Real-World Activities** are shown on the left.

Send to Workstation is an activity performed by a remote device to send DCOs to the ImageVision to be stored by the **Storage** local activity.

Query Archive and **Retrieve from Archive** are local activities performed by the ImageVision to query the database of a remote device and to send orders for retrieving DCOs. The corresponding activities performed by a remote device are **Query** and **Retrieve**.

Print jobs can be sent by the **Send Print Job** local activity to be printed by the **Print** activity on the remote device.

DCOs can be send by the **Send** local activity upon operator request. They are stored by the **Storage** activity on the remote device.

Echo to Workstation is an activity performed by a remote device to verify communication with ImageVision. The local activity performed by ImageVision is **Verification**.

2.2 Functional Definition of Application Entities

The ImageVision software acts as a single Application Entity (AE) providing a general display service for medical images and other related objects. The AE is able to receive images for storage, emit query and retrieve requests and to send images and other objects to remote devices. It also can send print jobs to other devices to generate hardcopies of the images.

The ImageVision acts as an SCU of the following DICOM Service Classes:

- Storage
- Query/Retrieve
- Basic Grayscale Print Management

The ImageVision acts as an SCP of the following DICOM Service Classes:

- Verification
- Storage

2.3 Sequencing of Real World Activities

No sequencing of Real-World activities are relevant.

3 ImageVision Application Entity Specification

3.1 ImageVision - Specification

The ImageVision provides standard conformance to the Verification Service Class by supporting the SOP Class and roles listed in Table 1.

SOP Class Name	UID	Role
Verification	1.2.840.10008.1.1	SCP

Table 1: Supported DICOM Verification SOP Classes and Roles

The ImageVision provides standard conformance to the Storage Service class by supporting the SOP Classes and roles listed in Table 2.

SOP Class Name	UID	Role
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	SCU/SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	SCU/SCP
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30	SCU/SCP
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29	SCU/SCP
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	SCU/SCP
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	SCU/SCP
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	SCU/SCP
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	SCU/SCP
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	SCU/SCP
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	SCU/SCP
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	SCU/SCP
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	SCU/SCP
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	SCU/SCP
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	SCU/SCP
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	SCU/SCP

Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	SCU/SCP
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	SCU/SCP
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	SCU/SCP
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	SCU/SCP
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	SCU/SCP
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	SCU/SCP
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	SCU/SCP
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	SCU/SCP
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	SCU/SCP
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	SCU/SCP
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	SCU/SCP
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	SCU/SCP
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	SCU/SCP
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	SCU/SCP
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	SCU/SCP
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	SCU/SCP
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	SCU/SCP
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	SCU/SCP
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	SCU/SCP
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	SCU/SCP
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	SCU/SCP

Table 2: Supported DICOM Storage SOP Classes and Roles

The ImageVision provides standard conformance to the Query/Retrieve Service class by supporting the SOP Classes and roles listed in Table 3.

SOP Class Name	**UID**	**Role**

Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	SCU
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	SCU

Table 3: Supported DICOM Query/Retrieve SOP Classes and Roles

The ImageVision provides standard conformance to the Print Management Service class by supporting the SOP Classes and roles listed in Table 4.

SOP Class Name	UID	Role
Basic Film Session	1.2.840.10008.5.1.1.1	SCU
Basic Film Box	1.2.840.10008.5.1.1.2	SCU
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	SCU
Printer	1.2.840.10008.5.1.1.16	SCU
Presentation LUT	1.2.840.10008.5.1.1.23	SCU

Table 4: Supported DICOM Print Management SOP Classes and Roles

3.1.1 Association Establishment Policies

3.1.1.1 General

All relevant DICOM communication parameters (AE Titles, hostnames or IP addresses, port numbers, etc.) are configurable. See section 5 for more information on configurable parameters. A maximum PDU size of 16KB will be offered when establishing associations. Any maximum PDU size will be accepted although PDU sizes larger than 64k will never be sent.

3.1.1.2 Number of Associations

The number of concurrent associations which can be accepted is configurable. See section 5 for more information on configurable parameters.

No fixed limit exists on the number of associations which can be initiated other than the resource limits imposed by the underlying operating system. In the following cases associations will be initiated by the ImageVision:

- for sending DCOs by explicit operator action
- to query a database on a remote device
- to retrieve DCOs from a remote device
- to send print jobs to a printer

3.1.1.3 Implementation Identifying Information

Implementation Class UID:	1.2.276.0.33.0.19990804.0.1.2 (when sending images to a DICOM printer) 1.2.276.0.7230010.3.0.3.5.4 (else)
Implementation Version Name:	MDCMTK20001123 (when sending images to a DICOM printer) OFFIS_DCMTK_354 (else)

3.1.2 Association Initiation Policy

The ImageVision will initiate associations in the following situations:

- When instructed by an operator (via the user interface) to send DCOs to a remote device.
- When instructed by an operator (via the user interface) to send a query request (C-FIND) in order to perform a query on a remote database.
- When instructed by an operator (via the user interface) to send a retrieve request (C-MOVE) in order to retrieve DCOs from a remote device.
- When instructed by an operator (via the user interface) to print images.

3.1.2.1 User Initiated Image Send

3.1.2.1.1 Associated Real-World Activity (User Send)

An operator can - via a graphical user interface - initiate sending images to a remote application entity. The associated local real-world activity is **User Send** and the remote real world activity is **Storage**. The operator can select any appropriate grouping of images (e.g. all patient images, all images of specific studies, selected series, individual images, etc.). All selected images will be sent over a single association.

3.1.2.1.2 Proposed Presentation Contexts

One or more presentation contexts will be proposed for *user initiated image send* as outlined in Table 5. However, only those Storage SOP Classes of images to actually be sent will be proposed (e.g. if only CT images are to be sent then only the CT Image Storage SOP Class will be proposed as an abstract syntax). Each abstract syntax will be proposed within at least 2 presentation contexts using different transfer syntax subsets. The presentation context proposal policy attempts to propose abstract syntax / transfer syntax combinations such that the original transfer syntax of received images can be maintained when sending images. This behavior is intended to eliminate transfer syntax conversion wherever possible.

The presentation context proposal policy can be modified by configuration options so

that only the default transfer syntax (Implicit VR Little Endian) is proposed during association negotiation with specific application entities.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Any of the Storage SOP Class names listed in Table 2.	Any of the Storage SOP Class UIDs listed in Table 2.	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 5: Proposed presentation contexts for operator initiated image send

3.1.2.1.3 SOP Specific Conformance

The behavior when receiving C-STORE response status codes is shown in Table 6. The operator will be informed by posting a message to the operator's user interface message area.

Status Code	Meaning	Behavior when receiving status code
	Any other status code not included in this table	The send activity will be terminated (the remaining images will not be sent). An error message will be posted to the operator and an error message recorded in a log file.
A7xx	Refused – Out of Resources	
A9xx	Error – Data Set does not match SOP Class	The remaining images will be sent if possible. An error message will be posted to the operator and an error message recorded in a log file.
Cxxx	Error – Cannot Understand	
B000	Warning – Coercion of Data Elements	The operator will be informed after all images have been sent.
B007	Warning – Data Set does not match SOP Class	
B006	Warning – Elements Discarded	
0000	Success	

Table 6: Behavior when receiving C-STORE response status codes (operator initiated)

Extended negotiation is not supported for the *User Send* Real-World Activity.

All optional attributes included in Storage SOP Instances will be sent as originally received. Storage SOP Instances are stored without modification when received and are not modified when sent. No additional attributes are added.

3.1.2.1.4 Association Termination

The association will be released upon receipt of the C-STORE-RSP message for the last sent image or upon receipt of refused or unknown status code.

If the peer AE aborts the association prematurely, all unsent SOP Instances are considered failed.

3.1.2.2 Query a Remote Database

3.1.2.2.1 Associated Real-World Activity (Query Archive)

An operator can - via a graphical user interface – query a remote dicom database to have a view on the content of that database. The associated local real-world activity is **Query Archive** and the remote real world activity is **Query**. The user can search the database by entering specific information for Patient Name, Study Date,… or can use wildcards which allow flexible queries.

3.1.2.2.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Study Root Query/Retrieve 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	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Table 7: Proposed presentation contexts for an operator initiated query

3.1.2.2.3 SOP Specific Conformance

Standard conformance is provided for the C-FIND SOP Class. Priority processing is not supported. Relational queries are not supported.

ImageVision supports all query keys listed in Table 8, Table 9 and Table 10. The tables also indicate if the attribute is supported as a matching key. For these matching keys the user can enter values via the user interface.

Attribute Name	Tag	Matching
Patient's Name	(0010,0010)	✓
Patient ID	(0010,0020)	✓
Patient's Birth Date	(0010,0030)	✓
Patient's Sex	(0010,0040)	
Number of Patient Related Studies	(0020,1200)	
Number of Patient Related Series	(0020,1202)	
Number of Patient Related Instances	(0020,1204)	
Study Date	(0008,0020)	✓
Study Time	(0008,0030)	✓
Accession Number	(0008,0050)	✓
Study ID	(0020,0010)	✓
Study Instance UID	(0020,000D)	✓
Referring Physician's Name	(0008,0090)	✓
Modalities in Study	(0008,0061)	✓
Study Description	(0008,1030)	
Number of Study Related Series	(0020,1206)	
Number of Study Related Instances	(0020,1208)	

Table 8: Supported Study Level Query Keys

Attribute Name	Tag	Matching
Modality	(0008,0060)	✓
Series Number	(0020,0011)	✓
Series Instance UID	(0020,000E)	✓
Body Part Examined	(0018,0015)	
Series Description	(0008,103E)	
Request Attribute Sequence	(0040,0275)	✓
> Requested Procedure ID	(0040,1001)	✓
> Scheduled Procedure Step ID	(0040,0009)	✓
Performed Procedure Step Start	(0040,0244)	✓

Date		
Performed Procedure Step Start Time	(0040,0245)	✓
Number of Series Related Images	(0020,1209)	

Table 9: Supported Series Level Query Keys

Attribute Name	**Tag**	**Matching**
General Image Level Query Keys		
Instance Number	(0020,0013)	✓
SOP Class UID	(0008,0016)	
SOP Instance UID	(0008,0018)	✓
Content Date	(0008,0023)	
Content Time	(0008,0033)	
Number of Frames	(0028,0008)	
Bits Allocated	(0028,0100)	
Rows	(0028,0010)	
Columns	(0028,0011)	
Observation DateTime	(0040,A032)	
Image Level Query Keys for Presentation State		
Presentation Label	(0070,0080)	
Presentation Description	(0070,0081)	
Presentation Creation Date	(0070,0082)	
Presentation Creation Time	(0070,0083)	
Presentation Creator's Name	(0070,0084)	
Referenced Series Sequence	(0008,1115)	
> Series Instance UID	(0020,000E)	
> Referenced Image Sequence	(0008,1140)	
>> Referenced SOP Class UID	(0008,1150)	
>> Referenced SOP Instance UID	(0008,1155)	
Image Level Query Keys for Structured Report and Key Image Notes		
Completion Flag	(0040,A491)	✓
Verification Flag	(0040,A493)	✓
Verifying Observer Sequence	(0040,A073)	✓
> Verifying Organization	(0040,A027)	

> Verification DateTime	(0040,A030)	✓
> Verifying Observer Name	(0040,A075)	✓
> Verifying Observer Identification Code Sequence	(0040,A088)	
>> Code Value	(0008,0100)	
>> Coding Scheme Designator	(0008,0102)	
>> Coding Scheme Version	(0008,0103)	
>> Code Meaning	(0008,0104)	
Referenced Request Sequence	(0040,A370)	
> Study Instance UID	(0020,000D)	
> Accession Number	(0008,0050)	
> Requested Procedure ID	(0040,1000)	
> Requested Procedure Code Sequence	(0032,1064)	
>> Code Value	(0008,0100)	
>> Coding Scheme Designator	(0008,0102)	
>> Coding Scheme Version	(0008,0103)	
>> Code Meaning	(0008,0104)	
Concept Name Code Sequence	(0040,A043)	✓
> Code Value	(0008,0100)	✓
> Coding Scheme Designator	(0008,0102)	✓
> Coding Scheme Version	(0008,0103)	
> Code Meaning	(0008,0104)	

Table 10: Supported Image Level Query Keys

The C-FIND response identifier can contain, in addition to the requested key attributes and the current query/retrieve level, the supplementary attributes listed in Table 11.

Attribute Name	**Tag**	**Note**
Specific Character Set	(0008,0005)	Ignored.
Retrieve AE Title	(0008,0054)	
Storage Media File-Set UID	(0008,0140)	
Storage Media File-Set ID	(0008,0130)	The Instance Availability (ONLINE, NEARLINE or OFFLINE) of the DCOs is displayed on the user interface and if available the Storage Media File-Set ID.
Instance Availability	(0008,0056)	

Table 11: Supplementary Response Identifier Keys

The meaning of status codes which can be returned in a C-FIND response are listed in Table 12. More detailed error information may be provided in the related fields Offending Element (0000, 0901) and Error Comment (0000,0902).

The behavior when receiving C-FIND response status codes is shown in **Fehler! V erweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.**Table 12. The operator will be informed by posting a message to the operator's user interface message area.

Status Code	Meaning	Behavior when receiving status code
	Any other status code not included in this table	An error message will be posted to the operator and an error message recorded in a log file.
A7xx	Refused – Out of Resources	
A8xx	Refused – SOP Class not supported	
A9xx	Failed – Identifier does not match SOP Class	
C000	Failed – Unable to process	
FE00	Cancel – Matching terminated due to cancel request	The query results received up to the last C-FIND-RSP will be displayed to the user on the user interface. The message "Query Failed" will be displayed on the user interface.
FF01	Warning – Unsupported Optional Keys	The query results will be displayed to the user on the user interface.
0000	Success	

Table 12: Behavior when receiving C-FIND response status codes (operator initiated)

Extended negotiation is not supported for the *Query Archive* Real-World Activity.

3.1.2.2.4 Association Termination

The association will be released upon receipt of a C-FIND-RSP message with a non-pending status.

3.1.2.3 Retrieve DCOs from a Remote Database

3.1.2.3.1 Associated Real-World Activity (Retrieve from Archive)

An operator can - via a graphical user interface – retrieve DCOs from a remote dicom database to display the DCOs for the user. The associated local real-world activity is **Retrieve from Archive** and the remote real world activity is **Retrieve**. The user can send a retrieve request by selecting a patient, a study a series or an image from the user interface.

3.1.2.3.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Study Root Query/Retrieve 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
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Table 13: Proposed presentation contexts for an operator initiated retrieve request

3.1.2.3.3 SOP Specific Conformance

The behavior when receiving C-MOVE response status codes is shown in Table 14. The operator will be informed that the DCOs arrived. The DCOs will be displayed in the user interface of the local database.

Status Code	Meaning	Behavior when receiving status code
	Any other status code not included in this table	An error message will be posted to the operator and an error message recorded in a log file.
A700	Refused – Out of Resources Number of Matches	
A701	Refused – Out of Resources Sub-Operations	
A800	Refused – SOP Class not supported	
A801	Failed – Move Destination unknown	

A9xx	Failed – Identifier does not match SOP Class	
C000	Failed – Unable to process	
B000	Warning – Sub-Operations Complete One Or More Failures	The DCOs retrieved from the SCP appear in the local database.
FE00	Cancel – Sub-Operations Terminated Due To Cancel Indication	
0000	Success	

Table 14: Behavior when receiving C-FIND response status codes (operator initiated)

Extended negotiation is not supported for the *Retrieve From Archive* Real-World Activity.

3.1.2.4 Print Images

3.1.2.4.1 Associated Real-World Activity (Send PrintJob)

The user can select a set of images to be printed to a remote dicom printer. The resulting hardcopy can be printed on transmissive (film) or reflective (paper) media. The associated local real-world activity is **Send PrintJob** and the remote real world activity is **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 Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Presentation LUT	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

Table 15: Proposed presentation contexts for an operator initiated print request

3.1.2.4.3 SOP Specific Conformance

ImageVision supports the SOP Classes listed in Table 16 as defined by the Basic Grayscale Print Management Meta SOP Class.

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

Table 16: Supported SOP Classes for the Basic Grayscale Print Management Meta SOP Class

Extended negotiation is not supported for the *Send PrintJob* Real-World Activity.

3.1.2.4.3.1 Conformance for Basic Film Session SOP Class

ImageVision includes the attributes from Table 17 in the N-CREATE request for the Basic Film Session SOP Class.

Attribute	Tag	Comment
Number of Copies	(2000,0010)	1
Print Priority	(2000,0020)	MED
Medium Type	(2000,0030)	<configurable>
Film Destination	(2000,0040)	<configurable>
Film Session Label	(2000,0050)	<configurable>

Table 17: Attributes for the Basic Film Session SOP Class

The N-SET and N-ACTION commands for the Basic Film Session SOP Class are unused. The N-DELETE command is used to delete the Film Session after all Film Boxes have been deleted.

3.1.2.4.3.2 Conformance for Basic Film Box SOP Class

ImageVision includes the attributes from Table 18 in the N-CREATE request for the Basic Film Box SOP Class.

Attribute	Tag	Comment
Image Display Format	(2010,0010)	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	
> Referenced SOP Class UID	(0008,1150)	
> Referenced SOP Instance UID	(0008,1155)	
Film Orientation	(2010,0040)	PORTRAIT
Film Size ID	(2010,0050)	
Magnification Type	(2010,0060)	<configurable>
Max Density	(2010,0130)	<configurable>
Smoothing Type	(2010,0080)	<configurable>
Border Density	(2010,0100)	<configurable>
Empty Image Density	(2010,0110)	<configurable>
Min Density	(2010,0120)	<configurable>
Trim	(2010,0140)	<configurable>
Referenced Presentation LUT Sequence	(2050,0500)	Will be sent if the Presentation LUT SOP Class was negotiated and a Presentation LUT SOP instance has successfully been created.
> Referenced SOP Class UID	(0008,1150)	
> Referenced SOP Instance UID	(0008,1155)	

Table 18: Attributes for the Basic Film Box SOP Class

The N-SET and N-ACTION commands for the Basic Film Box SOP Class are unused. The N-DELETE command is used to delete the Film Box with all Image Boxes managed by the Film Box.

3.1.2.4.3.3 Conformance for the Basic Grayscale Image Box SOP Class

ImageVision includes the attributes from Table 19 in the N-CREATE request for the Basic Grayscale Image Box SOP Class.

Attribute	Tag	Comment
ImagePosition	(2020,0010)	1
Basic Grayscale Image Sequence	(2020,0110)	Only a single item is present.
> Samples Per Pixel	(0028,0002)	1
> Photometric Interpretation	(0028,0004)	
> Rows	(0028,0010)	Depends on the resolution of the display device. Configurable.
> Columns	(0028,0011)	Depends on the resolution of the display device. Configurable.
> Pixel Aspect Ratio	(0028,0034)	
> Bits Allocated	(0028,0100)	8
> Bits Stored	(0028,0101)	8
> High Bit	(0028,0102)	7
> Pixel Representation	(0028,0103)	0
> Pixel Data	(7FE0,0010)	

Table 19: Attributes for the Basic Grayscale Image Box SOP Class

The N-SET and N-ACTION commands for the Basic Grayscale Image Session SOP Class are unused.

3.1.2.4.3.4 Conformance for Presentation LUT SOP Class

ImageVision includes the attributes from Table 20 in the N-CREATE request for the Presentation LUT SOP Class.

Attribute	Tag	Comment
Presentation LUT Shape	(2050,0010)	IDENTITY

Table 20: Attributes for the Presentation LUT SOP Class

The N-SET and N-ACTION commands for the Presentation LUT SOP Class are unused. The N-DELETE command is used to delete the Presentation LUT for the current Basic Film Box or Film Session.

3.1.2.4.4 Association Termination

The association will be released upon receipt of the N-DELETE-RSP of the Basic Film Session.

3.1.3 Association Acceptance Policy

The ImageVision application will accept associations for the following situations:

- To respond to communication verification requests from remote devices.
- To receive DCOs for storage from remote devices.

Associations can be accepted at any time the ImageVision application entity is active. The ImageVision application entity may not be active if stopped or restarted by an operator.

Associations will be terminated (A-ABORT) if they are idle for more than 20 minutes.

3.1.3.1 Respond to Communication Verification Requests

3.1.3.1.1 Associated Real-World Activity

An association will be accepted from a remote Application Entity in order to respond to communication verification requests. The local real-world activity is **Verification** and the remote real world activity is **Echo to Workstation**.

3.1.3.1.2 Acceptable Presentation Contexts

Any of the presentation contexts shown in Table 21 can be accepted.

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

Table 21: Acceptable presentation context for Verification

3.1.3.1.3 SOP Specific Conformance

Standard conformance is provided for the Verification SOP Class.

3.1.3.1.4 Presentation Context Acceptance Criteria

A presentation context for the Verification SOP Class will always be accepted provided the transfer syntax selection policy is met. Presentation contexts for other supported activities may also be accepted on the same association.

3.1.3.1.5 Transfer Syntax Selection Policies

Only the default DICOM Transfer Syntax (Implicit VR Little Endian) will be accepted.

3.1.3.2 Receive DCOs for Storage

3.1.3.2.1 Associated Real-World Activity

An association will be accepted from a remote Application Entity in order to receive images for storage. The local real-world activity is **Storage** and the remote real world activity is **Send to Workstation**.

Received images are stored on local disk, summary information extracted from the image and inserted in a central database. The extraction of summary information is tolerant of encoding errors wherever possible. Invalid attribute values will be retained in the image files but may be ignored or truncated when inserted into the central database.

3.1.3.2.2 Acceptable Presentation Contexts

Any of the presentation contexts shown in Table 22 can be accepted.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Any of the Storage SOP Class names listed in Table 2.	Any of the Storage SOP Class UIDs listed in Table 2.	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Table 22: Acceptable presentation contexts for storage

3.1.3.2.3 SOP Specific Conformance

Conformance to the SOP Classes of the Storage Service Class is at Level 2 (Full). Moreover, all received attributes (Type 1, Type 2, Type 3 and Private) are stored without modification. No attributes are discarded. Received images are written to local disk using the DICOM File Format as specified in PS 3.10. The identity of the transfer syntax used to receive the image is recorded in the File Format meta header along with the Source Application Entity Title.

No specific policies are required concerning the attribute Lossy Image Compression

(0028,2110).

No automatic coercion of attribute values will be performed.

If a success or warning status is returned in a C-STORE response the image has been stored to local disk and registered in the central database. If an image is received containing a SOP Instance UID which is already stored in the database then a success status is returned and the image is updated.

The meaning of status codes which can be returned in a C-STORE response are listed in Table 23. More detailed error information may be provided in the related fields Offending Element (0000, 0901) and Error Comment (0000,0902).

Status Code	Meaning	Detail
A700	Refused – Out of Resources	Insufficient disk space is available or insufficient permissions exist to store the image. The image cannot be stored. An error message is recorded in a log file.
A900	Error – Data Set does not match SOP Class	A serious incompatibility between the dataset and the supposed SOP Class was detected. The image cannot be stored. An error message is recorded in a log file.
C000	Error – Cannot Understand	A serious error occurred while parsing the image or an error occurred while updating the database. The image cannot be stored. An error message is recorded in a log file.
0000	Success	The image has been successfully stored or an image with the same SOP Instance UID already exists. A message is recorded in a log file.

Table 23: C-STORE response status codes

3.1.3.2.4 Presentation Context Acceptance Criteria

Presentation contexts for any of the supported Storage SOP Classes will always be accepted provided the transfer syntax selection policy is met. Presentation contexts for other supported activities may also be accepted on the same association.

3.1.3.2.5 Transfer Syntax Selection Policies

Preference is by default given to receiving images encoded using an explicit transfer syntax. However, configuration options can be used to limit acceptance to only the default DICOM Transfer Syntax (Implicit VR Little Endian) when accepting associations

from specific application entities (see section 5 for configuration options).

When multiple Transfer Syntaxes are presented, a selection is made using following priority:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

4 Communication Profiles

4.1 Supported Communication Stacks

TCP/IP Network Communication is supported as defined in PS 3.8.

4.1.1 TCP/IP Stack

The TCP/IP stack is inherited from the underlying operating system.

4.1.1.1 Physical Network Media Support

No dependency exists on the physical network medium over which TCP/IP executes. The supported physical network media are inherited from the underlying operating system.

5 Configuration

The following DICOM-related network parameters are configurable by the user via a graphical user interface and are stored in the local database:

- The title of the ImageVision Application Entity. Associations will not be accepted if the Called AE Title is not equal to the configured AE Title (this behaviour may be switched off by a field service engineer, see below).
- The Port Number to use when listening for associations (default 104).
- The AE Titles, IP Address and Port Number for all peer application entities. These parameters must be configured before associations can be initiated or accepted. Association attempts from unknown AE Title and IP Address pairs will not be accepted (this behaviour may be switched off by a field service engineer, see below).
- Support by peer application entities for the Verification SOP Class. If supported, a connectivity test can be performed upon user request.
- The preferred transfer syntax for each peer application entity. The transfer syntax selection policies can be configured such that only the Implicit VR Little Endian Transfer Syntax will be accepted for individual application entities.

The following DICOM-related network parameters are configurable by a field service engineer for the *Storage, Query/Retrieve, Retrieval Send*, *Echo Provider, Get Storage Commitment and Get MPPS* local activities:

- The number of concurrent associations which can be accepted (default 20). This limit is bound only by the availability of underlying operating system resources.
- General association inactivity timeout (default 1800 seconds).
- Timeout waiting for a DIMSE request (default 1200 seconds).
- Timeout waiting for a DIMSE response (default 300 seconds).
- Maximum size of a received PDU (default 16KB).
- If ImageVision should check Application Entity titles against its local database. If this checking AE titles is switched off, DICOM service class users that are not configured in the local database will also be able to use the DICOM services mentioned above.

The *User Send* and *User Echo* local activities use timeout and maximum PDU size parameters with defaults as defined above but are not configurable by a field service engineer.

6 Support of Extended Character Sets

The following extended character sets are supported:

ISO-IR 100 Latin Alphabet Supplementary Set No. 1 (ISO 8859-1)

Note: The DICOM default character set (ISO-IR 6) is a subset of ISO-IR 100.