
DICOM

Conformance Statement

Allura 3D-RA Release 5
StentBoost Release 2 and 3
Allura 3D-CA Release 2
CTTrueView Release 1
Allura XperCT Release 2



PHILIPS

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1. DICOM CONFORMANCE STATEMENT OVERVIEW

A table of Supported Networking DICOM Service (SOP) Classes is provided with roles (User/Provider)

Table 1: Network Services

SOP Class		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Print Management			
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Transfer			
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	No
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	No

The services can be specified as a SCU, SCP or as an Option, which means that it is either configurable or that it can be purchased separately.

A table of Supported Media Storage Application Profiles (with roles) is provided

Table 2: Media Services

Media Storage Application Profile	Write Files (FSC)	Read Files (FSR)
Compact Disk – Recordable		
General Purpose CD-R Interchange	Yes	Yes*
CT/MR Studies on CD-R	No	Yes
DVD		
CT/MR Studies on DVD Media	No	Yes
General Purpose DVD Interchange with JPEG	Yes	Yes*

When data is written to DVD+R and DVD-R, the media is not finalized.

* Note: File Set Reader functionality is supported for the following data:

1. Specialized non-DICOM information written by this application
2. CT/MR data:

The following SOP classes are supported:

- a. CT Image Storage (1.2.840.10008.5.1.4.1.1.2)
- b. MR Image Storage (1.2.840.10008.5.1.4.1.1.4)

Only those CT/MR series, which satisfy the following conditions, will be read by the application:

- a. All slices have orthogonal axes
- b. Each slice in the volume has the same orientation
- c. Subsequent slices have the same distance between them
- d. Slices have 1 or 2 bytes data per pixel
- e. The volume built out of the slices does not exceed 256MB (1MB=1048576 bytes)
- f. The minimum number of slices is 2 and each slice is minimally 2 pixels wide and long
- g. The maximum number of slices is 1024 and each slice is maximally 1024 pixels wide and long
- h. All slices belong to the same volume, have the same matrix size, Field of View (extent), echo number, echo time, temporal position identifier, table height
- i. All slices have origins on a straight line
- j. All slices have the same image type

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3. INTRODUCTION

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3: Revision History

Document Version	Date of Issue	Author	Description
1	2008 Jan 24	Karthik K Rao	DICOM Conformance Statement: Final version (XV7.2)

3.2. Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

3.3. Remarks

The DICOM Conformance Statement is contained in chapter 4 through 8 and follows the contents and structuring requirements of DICOM PS 3.2.

This DICOM Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.
It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.
- **Validation**
Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.
- **New versions of the DICOM Standard**
The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4. Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4. The word Philips in this document refers to Philips Medical Systems.

The following acronyms and abbreviations are used in this document.

In this document, the term 'Interventional Workstation' is used to identify any of the products mentioned on the cover page: Allura 3D-RA, StentBoost, Allura 3D-CA or CTTrueView.

Protected Health Information

Protected Health Information is considered as information records, and not the flow of information between the systems [IHE]

Time Server

A system unit that knows, maintains and distributes the correct time in the enterprise [IHE]

The following acronyms and abbreviations are used in this document.

AE	Application Entity
ALWAYS	Always Present
ANAP	Attribute Not Always Present
ANAPCV	Attribute Not Always Present/ Conditional Value
ANSI	American National Standard Institute
AP	Application Profile
AUTO	the attribute value is generated automatically
BOT	Basic Offset Table
CD	Compact Disc
CD-R	CD-Recordable
CD-RW	CD-Rewritable
CONFIG	the attribute value source is a configurable parameter
CT	Computed Tomography
CTTV	Coronary Tomography True View
DCR	Dynamic Cardio Review
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
EBE	DICOM Explicit VR Big Endian
EBW	Extended Brilliance Workspace
ELE	DICOM Explicit VR Little Endian
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
GUI	Graphic User Interface
HIS	Hospital Information System
HL7	Health Level Seven
ILE	DICOM Implicit VR Little Endian
IOD	Information Object Definition
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
PHI	Protect Health Information

ISIS	Information System – Imaging System
MR	Magnetic Resonance
PDU	Protocol Data Unit
PACS	Picture Archiving and Communication Storage
RIS	Radiology Information System
RWA	Real-World Activity
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/ Internet Protocol
TLS	Transport Layer Security protocol
UID	Unique Identifier
USER	the attribute value source is from User input

The following terms are used in this document.

Audit Record Repository

A system unit that receives and collects audit records from multiple systems [IHE].

Image Display

A system that offers browsing of patients' studies. In addition, it may support the retrieval and display of selected sets of images, presentation states, Key Image Notes, and Evidence Documents [IHE].

3.5. References

- [DICOM] Digital Imaging and Communications in Medicine, Part 1 – 18 (NEMA PS 3.1– PS 3.18), National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 1847 Rosslyn, Virginia. 22209, United States of America Internet: <http://medical.nema.org/>
Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2006) plus all the supplements and correction items that have been approved as Final Text.

4. NETWORKING

This section contains the networking related services (vs. the media related ones).

4.1. Implementation model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the “external world” or Real-World Activities,
- A functional description of each Application Entity, and
- The sequencing constraints among them.

4.1.1. Application Data Flow

The Interventional Workstation behaves as a system with four Application Entity (AE). The related Implementation Model is shown in Figure 1.

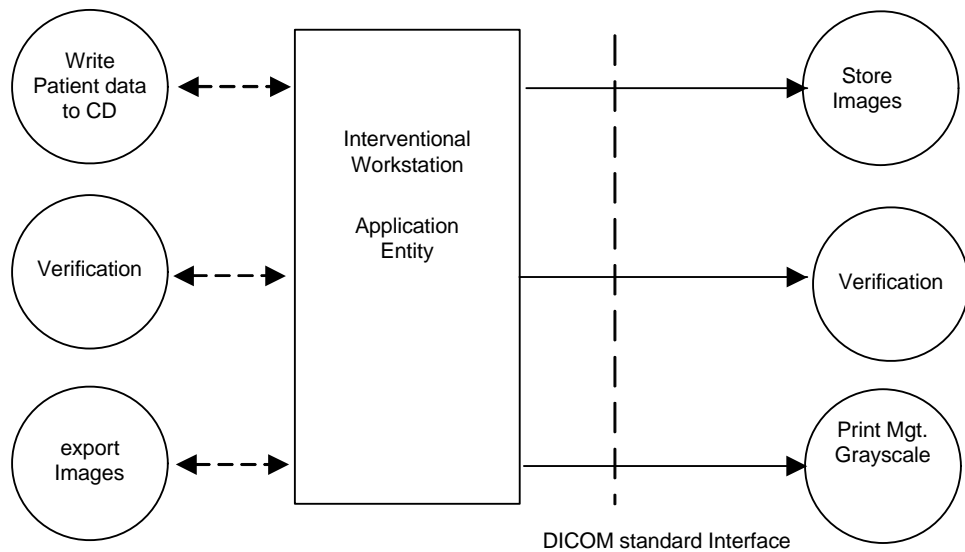


Figure 1: Application Data Flow Diagram

The images to be sent are selected from one or more examinations of a patient. At export request the images will be converted into DICOM format and sent out to a remote destination. While writing images to media, each snapshot of the selected patient will be converted to DICOM media format and written on media.

4.1.2. Functional Definition of AE's

This section contains a functional definition for each individual local Application Entity. This describes in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions. In this sense, "DICOM services" refers not only to DICOM Service Classes, but also to lower level DICOM services, such as Association Services.

4.1.2.1. Functional Definition of the interventional workstation

The interventional Workstation AE titles are configurable by service engineer.

4.1.3. Sequencing of Real World Activities

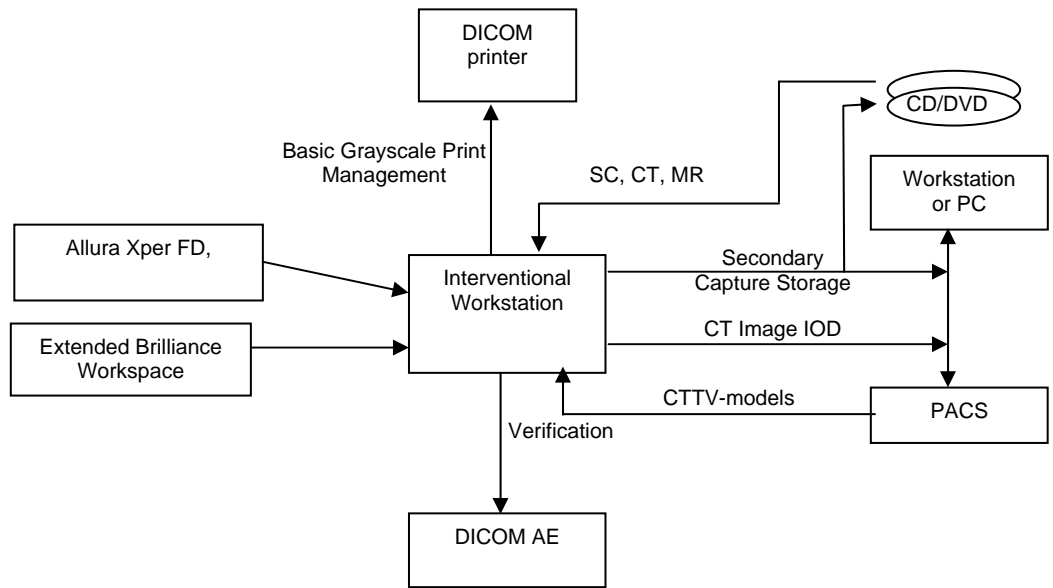


Figure 2: Interventional Workstation in a DICOM network

Though XtraVision is an SCP for data coming in from Allura and EBW, we accept data only in private, Philips-specific format. Hence, details have been left out of this document. PACS can only be used when it's configured to 'accept' DICOM private attributes, e.g. the private attributes are not deleted upon reception. This way we can ensure that interventional workstation accepts CTTV-model from the PACS

4.2. AE Specifications

The next section in the DICOM Conformance Statement is a set of application entity specifications. There are as many of these subsections as there are different AE's in the implementation.

4.2.1. Interventional Workstation

Detail of this specific Application Entity is specified in this section.

4.2.1.1. SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes.

Table 4: SOP Classes for Interventional Workstation

SOP Class Name	SOP Class UID	SCU	SCP
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Yes	No
Verification SOP Class	1.2.840.10008.1.1	Yes	No

Note: Any SOP specific behavior is documented later in the conformance statement in the applicable SOP specific conformance section.

4.2.1.2. Association Policies

Each AE specification contains a description of the general association establishment and acceptance policies of the AE.

4.2.1.2.1. General

The DICOM standard application context has specified.

Table 5: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.1.2.2. Number of Associations

The number of simultaneous associations that an Application Entity may support as a Initiator or Acceptor is specified.

Table 6: Number of Associations as an Association Initiator for Interventional Workstation

Maximum number of simultaneous associations	1
---------------------------------------------	---

Table 7: Number of Associations as an Association Acceptor for Interventional Workstation

Maximum number of simultaneous associations	0
---------------------------------------------	---

4.2.1.2.3. Asynchronous Nature

If the implementation supports negotiation of multiple outstanding transactions this is stated here, along with the maximum number of outstanding transactions supported.

Table 8: Asynchronous Nature as an Association Initiator for Interventional Workstation

Maximum number of outstanding asynchronous transactions	The interventional Workstation does not support asynchronous operations and will not perform asynchronous window negotiation.
---------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------

4.2.1.2.4. Implementation Identifying Information

The value supplied for Implementation Class UID and version name are documented here.

Table 9: DICOM Implementation Class and Version for Interventional Workstation

Depending on the version installed, the values can be either:

Implementation Class UID	1.3.46.670589.7.8.7.2
Implementation Version Name	XV_rel_7.2

4.2.1.2.5. Communication Failure Handling

The behavior of the AE during communication failure is summarized in next table.

Table 10: Communication Failure Behavior

Exception	Behavior
Unreachable Host	Message "Storage error: Check storage device"
Connection lost in middle of transfer	Message "Storage error: Check storage device"
Network Timeouts	Message "Communication cannot be established. Call service"

4.2.1.3. Association Initiation Policy

This describes the conditions under which the AE will initiate an association.

The behavior of the AE during association rejection is summarized in next table

Table 11: DICOM Association Rejection Handling

Result	Source	Reason/Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	Message
		2 – application-context-name-not-supported	Message
		3 – calling-AE-title-not-recognized	Message
		7 – called-AE-title-not-recognized	Message
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Message
		2 – protocol-version-not-supported	Message
3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Message	
	2 – local-limit-exceeded	Message	
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	Message
		2 – application-context-name-not-supported	Message
		3 – calling-AE-title-not-recognized	Message
		7 – called-AE-title-not-recognized	Message

Result	Source	Reason/Diagnosis	Behavior
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	Message
		2 – protocol-version-not-supported	Message
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	Message
		2 – local-limit-exceeded	Message

The message is in all cases: “Communication cannot be established. Call service”.
 The behavior of the AE on receiving an association abort is summarized in next table

Table 12: DICOM Association Abort Handling

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Message
2 – DICOM UL service-provider	0 – reason-not-specified	Message
	1 – unrecognized-PDU	Message
	2 – unexpected-PDU	Message
	4 – unrecognized-PDU parameter	Message
	5 – unexpected-PDU parameter	Message
	6 – invalid-PDU-parameter value	Message

The behavior of the AE for sending an association abort is summarized in next table.

Table 13: DICOM Association Abort Policies

Source	Reason/Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	Message
2 – DICOM UL service-provider	0 – reason-not-specified	Message
	1 – unrecognized-PDU	Message
	2 – unexpected-PDU	Message
	4 – unrecognized-PDU parameter	Message
	5 – unexpected-PDU parameter	Message
	6 – invalid-PDU-parameter value	Message

4.2.1.3.1. (Real-World) Activity – Print Management As SCU

4.2.1.3.1.1. Description and Sequencing of Activities

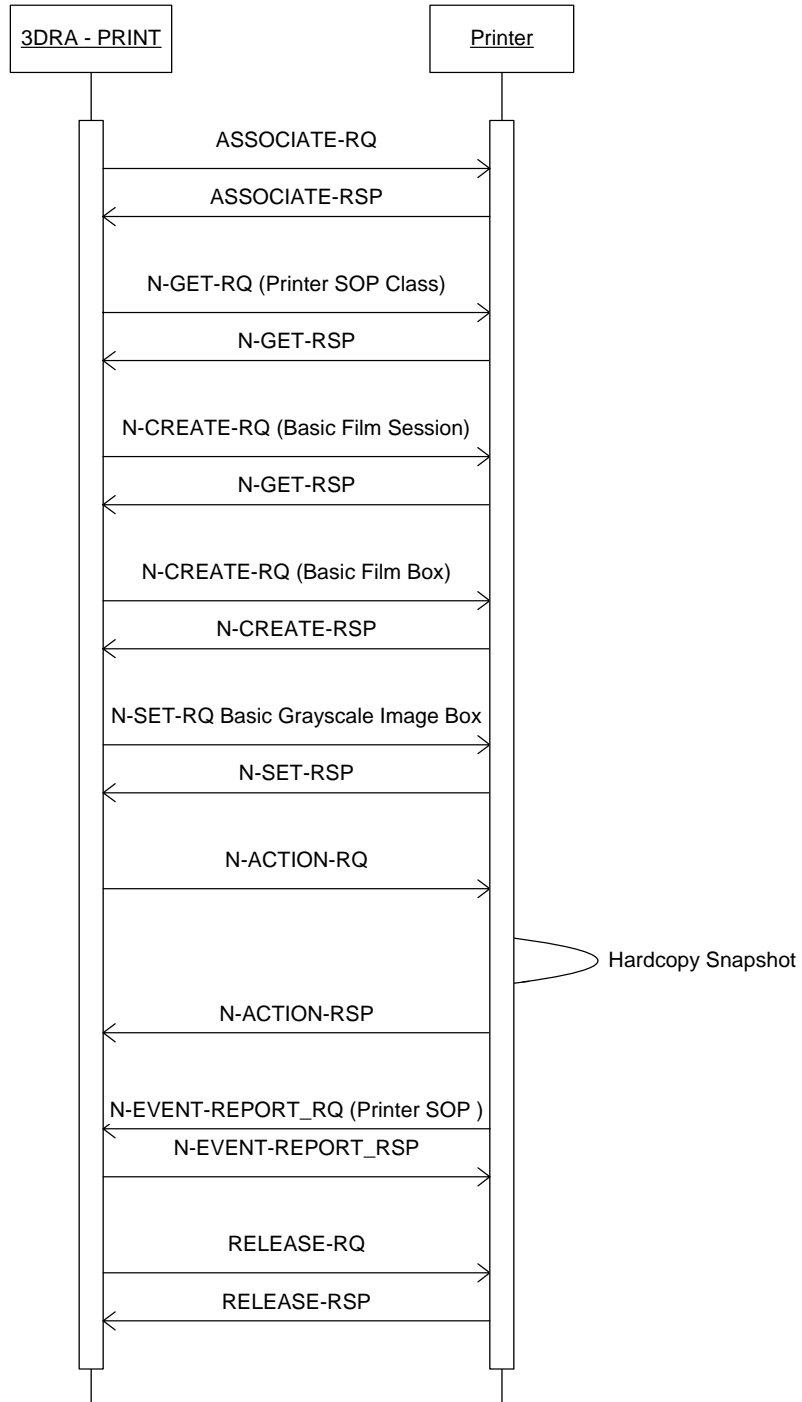


Figure 3: (Real World) Activity - Print Management As SCU

4.2.1.3.1.2. Proposed Presentation Contexts

Table 14: Proposed Presentation Contexts for (Real-World) Activity – Print Management As SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	ILE ELE EBE	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

This section specifies each IOD created (including private IOD's).

Abbreviations used in the Module table for the column "Presence of Value" are:

- ALWAYS The attribute is always present with a value
- EMPTY The attribute is always present without any value (attribute sent zero length)
- VNAP The attribute is always present and its Value is Not Always Present (attribute sent zero length if no value is present)
- ANAP The attribute is present under specified condition – if present then it will always have a value
- VNAPCV The attribute is present under specified condition – if present then its Value is Not Always Present (attribute sent zero length if condition applies and no value is present)
- ANAPEV The attribute is present under specified condition – if present then it will not have any value

The abbreviations used in the Module table for the column "Source" are:

- AUTO The attribute value is generated automatically
- CONFIG The attribute value source is a configurable parameter
- COPY The attribute value source is another SOP instance
- FIXED The attribute value is hard-coded in the application
- IMPLICIT The attribute value source is a user-implicit setting
- MPPS The attribute value is the same as that use for Modality Performed Procedure Step
- MWL The attribute value source is a Modality Worklist
- USER The attribute value source is explicit user input

4.2.1.3.1.3. SOP Specific Conformance for Basic Film Box SOP Class

4.2.1.3.1.3.1. Dataset Specific Conformance for Basic Film Box N-CREATE SCU

Table 15: Basic Film Box Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Display Format	2010,0010	ST	"STANDARD\1,1", "STANDARD\1,2", "STANDARD\2,2", "STANDARD\2,3"	ALWAYS	USER	
Film Orientation	2010,0040	CS		ALWAYS	AUTO	
Film Size ID	2010,0050	CS	8IN * 10 IN, 10IN * 12 IN, 10 IN * 14IN, 11IN * 14IN, 14IN * 14IN, 14IN * 17IN, 24CM * 24CM, 24CM *30CM.	ALWAYS	CONFIG	
Magnification Type	2010,0060	CS	BILINEAR, CUBIC, NONE, REPLICATE	ALWAYS	CONFIG	
Smoothing Type	2010,0080	CS		ALWAYS	CONFIG	
Border Density	2010,0100	CS	BLACK	ALWAYS	FIXED	
Empty Image Density	2010,0110	CS	BLACK	ALWAYS	FIXED	
Min Density	2010,0120	US		ALWAYS	AUTO	0-349 (printer dependent)
Max Density	2010,0130	US		ALWAYS	CONFIG	1-350
Trim	2010,0140	CS	NO	ALWAYS	FIXED	
Configuration Information	2010,0150	ST		ALWAYS	CONFIG	

Table 16: Basic Film Box Relationship Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Referenced Film Session Sequence	2010,0500	SQ		ALWAYS	AUTO	Parent Film Session
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.5.1.1.1	ALWAYS	FIXED	
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.
Aborting print job	When the print workflow is aborted by the printer, the standard error message is displayed. There can be considerable delay before the message is shown to the user.

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7: DICOM Command Communication Failure Behavior

4.2.1.3.1.4. Dataset Specific Conformance for Basic Film Box N-ACTION SCU

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Service Status	Code	Further Meaning	Description
Success	0000	Film Box successfully created	e.g. The SCP has successfully returned all matching information.
Error	<>0000	There is an existing Film Box that has not been printed and N-ACTION at the Film Session level is not supported. A new Film Box will not be created when a previous Film Box has not been printed.	Stop Job + UI Message
Warning	<>0000	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	Continue Job + UI Message

Status Response

:

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.
Aborting print job	When the print workflow is aborted by the printer, the standard error message is displayed. There can be considerable delay before the message is shown to the user.

Command Communication Failure Behavior

4.2.1.3.1.5. SOP Specific Conformance for Basic Film Session SOP Class

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

The behavior of an Application Entity SOP class is summarized as shown in next Table . The standard as well as the manufacturer specific status codes and their corresponding behavior is specified.

4.2.1.3.1.5.1. Dataset Specific Conformance for Basic Film Session N-CREATE SCU

Table 19: Basic Film Session Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Number of Copies	2000,0010	IS		ALWAYS	USER	1-9
Print Priority	2000,0020	CS	HIGH, LOW, MED	ALWAYS	CONFIG	
Medium Type	2000,0030	CS	BLUE FILM, CLEAR FILM, CURRENT, PAPER	ALWAYS	CONFIG	

Film Destination	2000,0040	CS	BIN_1, MAGAZINE, PROCESSOR	ALWAYS	CONFIG	
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Table 20: N-CREATE-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Film belonging to the film session are accepted for printing; if supported, the Print Job SOP Instance is created.	Continue Job
Error	<>0000	Film Session SOP Instance hierarchy does not contain Film Box SOP Instances. OR Unable to create Print Job SOP Instance; print queue is full. OR Image size is larger than image box size. OR Combined Print Image size is larger than the Image Box size.	Stop Job + UI Message
Warning	<>0000	Film session printing (collation) is not supported. OR Film Session SOP Instance hierarchy does not contain Image Box SOP Instances (empty page). OR Image size is larger than image box size, the image has been Demagnified. OR Image size is larger than the Image Box size. The Image has been cropped to fit. OR Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	Continue Job + UI Message

Table 21: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.
Aborting print job	When the print workflow is aborted by the printer, the standard error message is displayed. There can be considerable delay before the message is shown to the user.

4.2.1.3.1.6. SOP Specific Conformance for Basic Grayscale Image Box SOP Class

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

The behavior of an Application Entity SOP class is summarized as shown in next Table.

The standard as well as the manufacturer specific status codes and their corresponding behavior are specified.

4.2.1.3.1.6.1. Dataset Specific Conformance for Basic Grayscale Image Box N-SET SCU

Table 22: Image Box Pixel Presentation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Position	2020,0010	US		ALWAYS	AUTO	
Polarity	2020,0020	CS	NORMAL	ALWAYS	FIXED	
Basic Grayscale Image Sequence	2020,0110	SQ		ALWAYS	AUTO	
>Samples per Pixel	0028,0002	US		ALWAYS	AUTO	
>Photometric Interpretation	0028,0004	CS		ALWAYS	AUTO	
>Rows	0028,0010	US		ALWAYS	AUTO	
>Columns	0028,0011	US		ALWAYS	AUTO	
>Bits Allocated	0028,0100	US		ALWAYS	AUTO	
>Bits Stored	0028,0101	US		ALWAYS	AUTO	
>High Bit	0028,0102	US		ALWAYS	AUTO	
>Pixel Representation	0028,0103	US		ALWAYS	AUTO	
>Pixel Data	7FE0,0010	OW/ OB		ALWAYS	AUTO	

Table 23: N-CREATE-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Image successfully stored in Image Box.	Continue Job
Error	<>0000	Image size is larger than image box size. OR Insufficient memory in printer to store the image. OR Combined Print Image size is larger than the Image Box size.	Stop Job + UI Message

Service Status	Code	Further Meaning	Description
Warning	<>0000	Image size larger than image box size, the image has been demagnified. OR Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead. OR Image size is larger than the Image Box size. The Image has been cropped to fit. OR Image size or Combined Print Image size is larger than the Image Box size. The Image or Combined Print Image has been decimated to fit.	Continue Job + UI Message

Table 24: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.
Aborting print job	When the print workflow is aborted by the printer, the standard error message is displayed. There can be considerable delay before the message is shown to the user.

4.2.1.3.1.7. SOP Specific Conformance for Printer SOP Class

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

The behavior of an Application Entity SOP class is summarized as shown in next Table . The standard as well as the manufacturer specific status codes and their corresponding behavior are specified.

4.2.1.3.1.7.1. Dataset Specific Conformance for Printer N-GET SCU

Table 25: N-GET-RQ Response Contents

Attribute Name	Tag	VR	Comment
Printer Status	2110,0010	CS	Retrieves the printer statuses OK or WARNING or ERROR. Xtravision takes the following actions for these responses. OK – Xtravision starts the print session WARNING – Shows warning message in UI and starts print session ERROR- Gets the printer status info (2110,0020), logs the information for service engineer , Closes the communication with the printer and exits.

Table 26: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.
Aborting print job	When the print workflow is aborted by the printer, the standard error message is displayed. There can be considerable delay before the message is shown to the user.

4.2.1.3.2. (Real-World) Activity – Image Export

4.2.1.3.2.1. Description and Sequencing of Activities

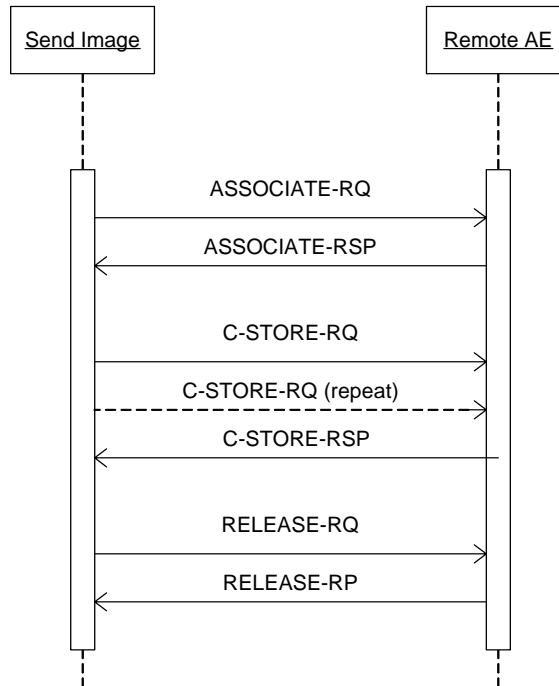


Figure 4: Real world activity Send Image

After selection of an image file, the file will be sent when initiating the Send command. The Interventional Workstation initiates one association to the pre-configured peer system and uses it to send the selected images and runs via C-STORE requests (and receives the associated C-STORE responses). The association is released after successful transfer of the images or when an error occurs.

The Interventional Workstation handles each send request one after another.

4.2.1.3.2.2. Proposed Presentation Contexts

Table 27: Proposed Presentation Contexts for (Real-World) Activity – Image Export

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
CT Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.3.2.3. SOP Specific Conformance for Storage SOP Classes

A not succeeded transfer is indicated on the console with an error messages:

Table 28: C-STORE-RQ Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Complete successful	Message in console
Refused	A7xx	Out of Resources	Message in console
Error	A9xx Cxxx	Data Set does not match SOP Class	Message in console
Error	0122	SOP class not supported	Message in console
Warning	B00x		Message in console

4.2.1.3.3. (Real-World) Activity – Interventional Workstation as SCU

4.2.1.3.3.1. Description and Sequencing of Activities

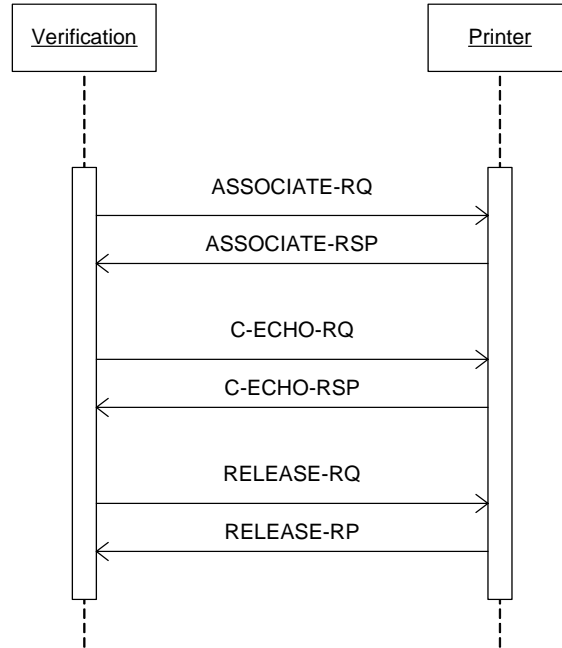


Figure 5: (Real World) Activity - Interventional Workstation as SCU

The operator is able to select one or more images from the internal database (via the Data Handling facility) and perform the Print operation on them.

The operator will select the print destination (out of choice list of configured printers) and some print parameters.
 As a result, the Interventional Workstation will initiate an association to the selected printer and uses it to send the Print Service Elements of the Print SOP Classes.

4.2.1.3.3.2. Proposed Presentation Contexts

Table 29: Proposed Presentation Contexts for (Real-World) Activity – Interventional Workstation as SCU

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.1.3.3.3. SOP Specific Conformance for Verification SOP Class

This section includes the SOP specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

The behavior of an Application Entity SOP class is summarized as shown in next Table . The standard as well as the manufacturer specific status codes and their corresponding behavior is specified.

4.2.1.3.3.3.1. Dataset Specific Conformance for Verification C-ECHO SCU

This section includes the dataset specific behavior, i.e. error codes, error and exception handling, time-outs, etc.

Table 30: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted using AP-ABORT and command marked as failed. The standard error message is displayed.
Association aborted	The command is marked as failed. The standard error message is displayed.

4.2.1.4. Association Acceptance Policy

Link between interventional workstation and modality is private. So, this section is **Not Applicable**.

4.3. Network Interfaces

4.3.1. Physical Network Interfaces

The Interventional Workstation provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard

The Interventional Workstation uses the TCP/IP program stack of the Windows XP workstation is used for the image transport.

The Interventional Workstation supports Ethernet (ISO 8802-3), 10 and 100-BaseT for the Image and Printer Interface.

4.3.2. Additional Protocols

4.3.2.1. Basic TLS Secure Transport Connection Profile

The Interventional Workstation conforms to the Basic TLS Secure Transport Connection Profile (for details see Section 7.1.1: DICOM Basic TLS Secure Transport Connection Profile).

4.3.2.2. Basic Time Synchronization Profile

The Interventional Workstation conforms to the Basic Time Synchronization Profile as an NTP Client implementing the Maintain Time transaction.

4.3.2.3. Basic Application Level Confidentiality Profile

Refer: 5.2.1.1.4. Patient data de-identification

4.4. See Section 7.2.3. Configuration

Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration is addressed in this section.

4.4.1. AE Title/Presentation Address Mapping

4.4.1.1. Local AE Titles

The local AE title mapping and configuration are specified.

Table 31: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
Import Provider	XVimport	3110
Remote Print	XVprint	3110
Remote Store SC	XVexport	3110
Remote Store CT Image SC	XVexportvol	3110
Echo	The AE Title used depends on the device to which the echo was done. It is one of the above three AE-titles: XVprint in case the device is a printer XVexport in case of a device capable of storing only secondary capture XVexportvol in case of a device capable of storing both secondary capture and volumes. XVecho	3110
Import Provider	XVimport	3110

4.4.1.2. Remote AE Title/Presentation Address Mapping

For remote applications that act as Service Class Provider the following additional information must be provided:

Table 32: Remote AE Title Configuration Table

Application Entity	Description	Default TCP/IP Port
Import Provider	Hostname IP-Adress Port number	3010
Remote Print	Hostname IP-Adress Port number	3010
Remote Store SC	Hostname IP-Adress Port number t	3010
Remote Store CT Image SC	Hostname IP-Adress Port number	3010
Echo	Hostname IP-Adress Port number	3010

4.4.2. Parameters

The specification of important operational parameters, their default value and range (if configurable) is specified here.

Table 33: Configuration Parameters table

Parameter	Configurable	Default Value
General Parameters		
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes	150s
General DIMSE level time-out values	No	150s
Time-out waiting for response to TCP/IP connect request. (Low-level timeout)	No	150s
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	150s
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	150s
Number of association retries	Yes	1
AE Specific Parameters		
Size constraint in maximum object size (see note 1)	No	256K
Maximum PDU size the AE can receive	No	28K
Maximum PDU size the AE can send	No	28K

5. MEDIA INTERCHANGE

5.1. Implementation Model

The implementation model shall identify the DICOM Application Entities in a specific implementation and relate the Application Entities to Real-World Activities.

5.1.1. Application Data Flow Diagram

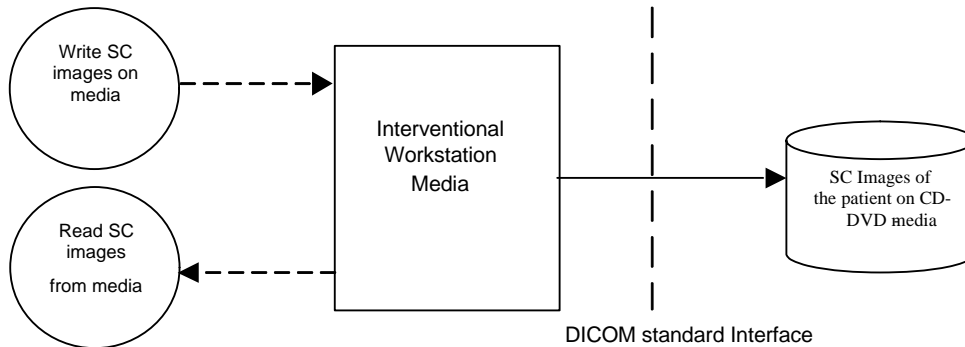


Figure 6: Application Data Flow Diagram

5.1.2. Functional Definitions of AE's

This session contains a functional definition for each local Application Entity. It's describe in general terms the functions to be performed by the AE, and the DICOM services used to accomplish these functions.

5.1.3. Sequencing of Real World Activities

This section contains a description of sequencing of Real-World Activities that the AE's require.

5.1.4. File Meta Information for Implementation Class and Version

This next table specified the list of values assigned to the File Meta Information attributes that pertain to the Implementation Class and Version.

Table 34: AE Related Application Profiles, Real-World Activities, and Roles

Depending on the version installed, the values can be either:

File Meta Information attributes	Value
Implementation Class UID	1.3.46.670589.7.8.7.2
Implementation Version Name	XV_rel_7.2

5.2. AE Specifications

The next section in the DICOM Conformance Statement is a set of Application Entity specifications. There shall be one such specification for each Application Entity type.

5.2.1. Interventional Workstation Media - Specification

The Interventional Workstation provides Standard Conformance to the DICOM Media Storage Service and File Format (PS 3.10) and the Media Storage Application Profiles.

The supported Application Profile, their Roles and the Service Class options, all defined in DICOM terminology, are listed in Table 35.

Table 35: AE Related Application Profiles, Real-World Activities, and Roles

Application Profile	Identifier	Real World Activity	Role	SC Option
General Purpose CD-R Interchange Profile	STD-GEN-CD	Write image(s) on CD-R disk	FSC	Interchange
	STD-GEN-CD	Write image(s) on CD-RW disk	FSC	Interchange
General Purpose DVD Interchange with JPEG	STD-GEN-DVD-JPEG	Write image(s) on DVD+/-R disk	FSC	Interchange
	STD-GEN-DVD-JPEG	Write image(s) on DVD+/-RW disk	FSC	Interchange

Note: Secondary Capture images only

5.2.1.1.1. (Real World) Activity DICOM Recording

After one or more patients are selected, the operator can choose to store the data onto a portable medium (CD or DVD). All Secondary Capture images belonging to all the selected patients will be stored on the portable medium in DICOM media format. Though the entire patient data can extend to more than one CD/DVD, the DICOM Secondary Capture images are stored in the first CD/DVD itself. Hence, if the user wants to read the secondary capture images at a DICOM File-Set-Reader (FSR), he/she only needs the first CD/DVD of the series.

If the data of a single directory is too large (for example, XperCT run), then it has to be written to DVDs. In this case, it will not be possible to write this data to multiple CDs

Table 36: SOP Classes and Transfer Syntaxes

IOD	SOP Class	Transfer Syntax and UID	FSC	FSR	FSU
Basic Directory	1.2.840.10008.1.3.10	ELE 1.2.840.10008.1.2.1	YES	YES	NO
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE 1.2.840.10008.1.2.1	YES	YES *	NO

* File Set Reader (FSR) functionality will be supported for specialized non-DICOM information only.

5.2.1.1.2. SOP FSC Conformance (Secondary Capture)

All Attributes from Table 5 and in addition all Type 1 attributes in the File Meta Information are written to the image files.

5.2.1.1.3. SOP FSC Conformance (Basic Directory)

The Interventional Workstation will not delete any snapshots, which are already written to the File Set.

5.2.1.1.4. Patient data de-identification

The following data is de-identified when the de-identification feature is switched on:

Table 37: De-identified Attributes

DICOM Attribute name	Tag	De-identification details
Patient's Name	0010,0010	Default shown in the de-identification dialog, or as selected by the user
Patient's Birth Date	0010,0030	Day and month changed to 1st January Year modified only if patient is more than 90 years old. In this case, age made equal to 90.
Patient ID	0010,0020	Randomly generated unique identifier
Study Date	0008,0020	Day and month changed to 1st January

Accession Number	0008,0050	An integer value
Series Date	0008,0021	Day and month changed to 1st January

The above table only applies to data acquired using an Allura and EBW systems. De-identification is not guaranteed for data that is received from Integris systems using a previous release of the application.

Media that have been written with the de-identification feature switched on will not have DICOM-format data.

In case of writing to CD/DVD, de-identification is supported. However, when the de-identification feature is active, no secondary capture images are written to the media (since it is possible that they contain burned-in patient information). Since secondary capture images are the only ones that we write in DICOM format, these disks will not contain a DICOMDIR, or any other DICOM files.

5.3. Augmented and Private Application Profiles

This section shall be used for the description of augmented and private Application Profiles.

5.3.1. Augmented Application Profiles

None.

5.3.2. Private Application Profiles

None.

5.4. Media Configuration

Any implementation's DICOM conformance may be dependent upon configuration that takes place at the time of installation. Issues concerning configuration shall be addressed in this section (e.g. the configuration of the source AE Title in file meta information).

6. SUPPORT OF CHARACTER SETS

Any support for character sets beyond the default character repertoire in Network and Media services shall be described here.

Table 38: Supported DICOM Character Sets of Integris 3DRA

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Latin alphabet No. 1	ISO_IR 100	-	ISO-IR 6	G0	ISO 646
		-	ISO-IR 100	G1	Supplementary set of ISO 8859

7. SECURITY

7.1. Security Measures

The Interventional Workstation allows the use of either a conventional (non-secure) DICOM communication or a secure DICOM communication based on the Transport Layer Security (TLS) protocol. If configured, the Interventional Workstation supports security measures for:

- secure authentication of a node
- integrity and confidentiality of transmitted data
- replay protection
- generation of audit trail records
- access control and user authentication.

7.1.1. DICOM Basic TLS Secure Transport Connection Profile

Secure communication is a "mode of operation" supported by the implementation of the DICOM Basic TLS Secure Transport Connection Profile [DICOM]. This functionality will be used by the nodes, which can authenticate each other before they exchange DICOM information. For secure communication the TLS protocol v1.0 is used which provides message authentication, integrity, confidentiality, and replay protection. Confidentiality is optional and can be controlled by the encryption settings.

The Interventional Workstation may communicate using the following Cipher Suites:

- TLS_RSA_WITH_NULL_SHA (Node authentication without encryption)
- TLS_RSA_WITH_3DES_SHA (Node authentication with encryption)

The Interventional Workstation supports X.509 certificates. The following TLS Certification checks will be done (TLS Handshake). The machine (either server or client) that will send its certificate will:

- Choose the certificate according to Common Name (CN) value in the Subject-field.
- This name is case-sensitive. All present certificates should have unique CN names.

The server verifies:

- That the client certificate is a X.509 certificate which is not tampered with
- That the client certificate is in the list of trusted certificates
- That the client certificate is not expired (present time is between "Valid From" and "Valid To" fields of the X.509 certificate)
- That the client certificate has the correct purpose (at least the Client Authentication purpose)

The client verifies:

- That the server certificate is a X.509 certificate which is not tampered with
- That the server certificate is in the list of trusted certificates
- That the server certificate is not expired (present time is between "Valid From" and "Valid To" fields of the X.509 certificate)
- That the server certificate has the correct purpose (at least Server Authentication purpose)

No verification is done on:

- Revocation of certificates
- Limiting the connection to a limited set of IP-addresses.

Node authentication with or without encryption is only possible when both nodes have:

- An access to their own private keys
- An access to a copy of the certificate of the other node containing its public key

The Interventional Workstation can only read certificates from the certificate stores of the HKEY_LOCAL_MACHINE registry key. It is the responsibility of the Hospital to setup and maintain the certificate stores. This includes the removal of revoked certificates and certificate updates prior to their expiration. Since neither X.500 directories, Lightweight Directory Access Protocol (LDAP) nor Certificate Revocation Lists (CRLs) are supported, the whole certificate chain needs to be replaced after a security breach.

The following figure presents the message flow of TLS handshake supported.

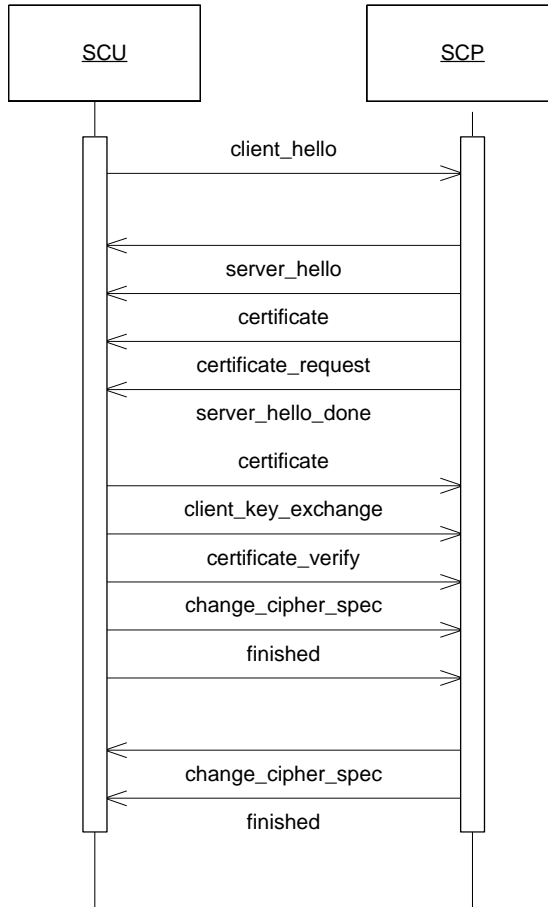


Figure 7: Message flow of TLS handshake

7.1.2. Generation of Audit Records

The Interventional Workstation can create audit messages according to the IHE Basic Security Integration Profile [IHE] to audit activities, to detect non-compliant behavior in the enterprise, and to facilitate detection of improper creation, access, modification and deletion of Protected Health Information (PHI). These messages may contain information that identifies the patient. The following messages will be created and sent to a central Audit Record Repository according to the Syslog protocol[SYSLOG]:

- ActorConfig (when security or networking configuration of the Interventional Workstation is modified using the service screen)
- ActorStartStop (when the Interventional Workstation starts or shuts down)
- BeginStoringInstances (when an exportable item is transferred from the Interventional Workstation to a remote network node)
- DICOMInstancesDeleted (when a patient or an exportable item is deleted)
- DICOMInstancesUsed (when patient details are viewed in the Interventional Workstation)
- Export (when a secondary capture is printed on a film/paper, and when a patient has been stored on CD/DVD)
- Import (when patient data is read from CD/DVD)
- SecurityAlert (when an authentication of a secure node during TLS negotiation [TLS] fails, e.g. Due to an invalid certificate)
- UserAuthenticated: This is logged only when the user logs in. No message is logged upon user logout, since it is not possible to determine the time of logout in every case.

If the central Audit Record Repository is not available, the audit trail record will be stored in a local buffer. Once the central Audit Record Repository is available again, the content of that buffer will be transferred to the central Audit Record Repository. The time that is part of the audit message will be the local system time. This time will be synchronized with a Time Server. The Time Server and central Audit Record Repository are elements of the Hospital infrastructure.

8. ANNEXES OF APPLICATION "INTERVENTIONAL WORKSTATION (APPLICATION)"

8.1. IOD Contents

8.1.1. Created SOP Instance

This section specifies each IOD created (including private IOD's). It should specify the attribute name, tag, VR, and value. The value should specify the range and source (e.g. user input, Modality Worklist, automatically generated, etc.). For content items in templates, the range and source of the concept name and concept values should be specified. Whether the value is always present or not shall be specified.

Abbreviations used in the IOD tables for the column "Presence of Module" are:

ALWAYS The module is always present
 CONDITIONAL The module is used under specified condition

Abbreviations used in the Module table for the column "Presence of Value" are:

ALWAYS The attribute is always present with a value
 EMPTY The attribute is always present without any value (attribute sent zero length)
 VNAP The attribute is always present and its Value is Not Always Present (attribute sent zero length if no value is present)
 ANAP The attribute is present under specified condition – if present then it will always have a value
 VNAPCV The attribute is present under specified condition – if present then its Value is Not Always Present (attribute sent zero length if condition applies and no value is present)
 ANAPEV The attribute is present under specified condition – if present then it will not have any value

The abbreviations used in the Module table for the column "Source" are:

AUTO The attribute value is generated automatically
 CONFIG The attribute value source is a configurable parameter
 COPY The attribute value source is another SOP instance
 FIXED The attribute value is hard-coded in the application
 IMPLICIT The attribute value source is a user-implicit setting
 MPPS The attribute value is the same as that use for Modality Performed Procedure Step
 MWL The attribute value source is a Modality Worklist
 USER The attribute value source is explicit user input

8.1.1.1. Secondary Capture Image Storage SOP Class

Table 39: IOD of Created Secondary Capture Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Equipment	SC Equipment Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	SC Image Module	ALWAYS
Image	SOP Common Module	ALWAYS

Image VOI LUT Module ALWAYS

Table 40: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		ALWAYS	AUTO	
Patient ID	0010,0020	LO		ALWAYS	AUTO	
Patient's Birth Date	0010,0030	DA		ALWAYS	AUTO	
Patient's Sex	0010,0040	CS	F, M, O	ALWAYS	AUTO	

Table 41: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Instance UID	0020,000D	UI		ALWAYS	AUTO	
Study Date	0008,0020	DA		ALWAYS	AUTO	
Study Time	0008,0030	TM		ALWAYS	AUTO	
Accession Number	0008,0050	SH		VNAP	AUTO	
Referring Physician's Name	0008,0090	PN		VNAP	AUTO	
Study ID	0020,0010	SH		ALWAYS	AUTO	

Table 42: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		ALWAYS	AUTO	
Patient Position	0018,5100	CS		ANAP	AUTO	
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ALWAYS	AUTO	
Performing Physician's Name	0008,1050	PN		VNAP	AUTO	
Performed Procedure Step Start Date	0040,0244	DA		ANAP	AUTO	
Performed Procedure Step Start Time	0040,0245	TM		ANAP	AUTO	
Performed Procedure Step ID	0040,0253	SH		ANAP	AUTO	
Performed Procedure Step Description	0040,0254	LO		VNAP	AUTO	
Referenced Performed Procedure Step Sequence	0008,1111	SQ		VNAP	AUTO	
>Referenced SOP Class UID	0008,1150	UI	1.2.840.10008.3.1.2.3.3	ALWAYS	AUTO	Uniquely identifies the referenced Modality performed procedure SOP Class.
>Referenced SOP Instance UID	0008,1155	UI		ALWAYS	AUTO	
Request Attributes Sequence	0040,0275	SQ		ANAP	AUTO	
>Scheduled Procedure Step ID	0040,0009	SH		ANAP	AUTO	
>Requested Procedure ID	0040,1001	SH		ANAP	AUTO	
>Scheduled Procedure Step Description	0040,0007	LO		ANAP	AUTO	
>Scheduled Protocol Code Sequence	0040,0008	SQ		ANAP	AUTO	
>>Code Value	0008,0100	SH		ANAP	AUTO	
>>Coding Scheme Designator	0008,0102	SH		ANAP	AUTO	
>>Code Meaning	0008,0104	LO		ANAP	AUTO	
>>Coding Scheme Version	0008,0103	SH		ANAP	AUTO	

Table 43: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips Medical Systems (Netherlands)	ALWAYS	FIXED	

Institution Name	0008,0080	LO		ALWAYS	CONFIG	Configured on the Modality.
Station Name	0008,1010	SH		ALWAYS	CONFIG	
Manufacturer's Model Name	0008,1090	LO	XtraVision	ALWAYS	CONFIG	
Software Version(s)	0018,1020	LO	R_7.2	ALWAYS	CONFIG	

Table 44: SC Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Conversion Type	0008,0064	CS	WSD	ALWAYS	AUTO	
Modality	0008,0060	CS	XA or CT	ALWAYS	AUTO	XA for data originating from Allura systems, CT for data originating from EBW

Table 45: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS		ALWAYS	AUTO	
Patient Orientation	0020,0020	CS		EMPTY	FIXED	(empty string)
Image Type	0008,0008	CS	DERIVED, SECONDARY	ALWAYS	FIXED	

Table 46: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Samples per Pixel	0028,0002	US	1	ALWAYS	FIXED	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	FIXED	
Rows	0028,0010	US	Size of the snapshot	ALWAYS	AUTO	
Columns	0028,0011	US	Size of the snapshot	ALWAYS	AUTO	
Bits Allocated	0028,0100	US	8	ALWAYS	FIXED	
Bits Stored	0028,0101	US	8	ALWAYS	FIXED	
High Bit	0028,0102	US	7	ALWAYS	FIXED	
Pixel Representation	0028,0103	US	0000	ALWAYS	FIXED	
Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

Table 47: SC Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Date of Secondary Capture	0018,1012	DA		ALWAYS	AUTO	
Time of Secondary Capture	0018,1014	TM		ALWAYS	AUTO	

Table 48: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ALWAYS	FIXED	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.7	ALWAYS	FIXED	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

Table 49: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS	127.5	ALWAYS	FIXED	
Window Width	0028,1051	DS	255	ALWAYS	FIXED	

8.1.1.2. CT Image Storage SOP Class

Table 50: IOD of Created CT Image Storage SOP Class Instances

Information Entity	Module	Presence Of Module
Patient	Patient Module	ALWAYS
Study	General Study Module	ALWAYS
Series	General Series Module	ALWAYS
Frame of Reference	Frame of Reference Module	ALWAYS
Equipment	General Equipment Module	ALWAYS
Image	Image Plane Module	ALWAYS
Image	Contrast/Bolus Module	ALWAYS
Image	CT Image Module	ALWAYS
Image	General Image Module	ALWAYS
Image	Image Pixel Module	ALWAYS
Image	SOP Common Module	ALWAYS
Image	VOI LUT Module	ALWAYS

Table 51: Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Patient's Name	0010,0010	PN		ALWAYS	AUTO	
Patient ID	0010,0020	LO		ALWAYS	AUTO	
Patient's Birth Date	0010,0030	DA		VNAP	AUTO	
Patient's Sex	0010,0040	CS		ALWAYS	AUTO	

Table 52: General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Study Instance UID	0020,000D	UI		ALWAYS	AUTO	
Study Date	0008,0020	DA		ALWAYS	AUTO	
Study Time	0008,0030	TM		ALWAYS	AUTO	
Accession Number	0008,0050	SH		VNAP	AUTO	
Referring Physician's Name	0008,0090	PN		VNAP	AUTO	
Study ID	0020,0010	SH		ALWAYS	AUTO	

Table 53: General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Modality	0008,0060	CS	XA	ALWAYS	FIXED	
Series Instance UID	0020,000E	UI		ALWAYS	AUTO	
Series Number	0020,0011	IS		ALWAYS	AUTO	
Series Date	0008,0021	DA		ALWAYS	AUTO	
Series Time	0008,0031	TM		ALWAYS	AUTO	
Performing Physician's Name	0008,1050	PN		ALWAYS	AUTO	
Patient Position	0018,5100	CS		VNAP	AUTO	
Performed Procedure Step Start Date	0040,0244	DA		ALWAYS	AUTO	
Performed Procedure Step Start Time	0040,0245	TM		ALWAYS	AUTO	
Performed Procedure Step ID	0040,0253	SH		ALWAYS	AUTO	
Performed Procedure Step Description	0040,0254	LO		VNAP	AUTO	
Request Attributes Sequence	0040,0275	SQ		ANAP	AUTO	
>Scheduled Procedure Step ID	0040,0009	SH		ALWAYS	AUTO	
>Requested Procedure ID	0040,1001	SH		ALWAYS	AUTO	
>Scheduled Procedure Step Description	0040,0007	LO		ALWAYS	AUTO	

Table 54: Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Frame of Reference UID	0020,0052	UI		ALWAYS	AUTO	
Position Reference Indicator	0020,1040	LO		VNAP	AUTO	

Table 55: General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Manufacturer	0008,0070	LO	Philips Medical Systems (Netherlands)	ALWAYS	FIXED	
Institution Name	0008,0080	LO		VNAP	AUTO	
Station Name	0008,1010	SH		ALWAYS	CONFIG	
Manufacturer's Model Name	0008,1090	LO	XtraVision	ALWAYS	CONFIG	
Software Version(s)	0018,1020	LO	R_7.2	ALWAYS	CONFIG	

Table 56: Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Position (Patient)	0020,0032	DS		ALWAYS	AUTO	
Image Orientation (Patient)	0020,0037	DS		ALWAYS	AUTO	
Pixel Spacing	0028,0030	DS		ALWAYS	AUTO	
Slice Thickness	0018,0050	DS		ALWAYS	AUTO	
Slice Location	0020,1041	DS		ALWAYS	AUTO	

Table 57: Contrast/Bolus Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Contrast/Bolus Agent	0018,0010	LO		VNAP	AUTO	

Table 58: CT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Image Type	0008,0008	CS	DERIVED, SECONDARY	ALWAYS	FIXED	
Rescale Intercept	0028,1052	DS		ALWAYS	AUTO	
Rescale Slope	0028,1053	DS		ALWAYS	AUTO	
KVP	0018,0060	DS		VNAP	AUTO	
Samples per Pixel	0028,0002	US	1	ALWAYS	FIXED	
Photometric Interpretation	0028,0004	CS	MONOCHROME2	ALWAYS	FIXED	
Bits Allocated	0028,0100	US	16	ALWAYS	FIXED	
Bits Stored	0028,0101	US	16	ALWAYS	FIXED	
High Bit	0028,0102	US	15	ALWAYS	FIXED	

Table 59: General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Instance Number	0020,0013	IS		ALWAYS	AUTO	

Table 60: Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Rows	0028,0010	US		ALWAYS	AUTO	
Columns	0028,0011	US		ALWAYS	AUTO	
Pixel Representation	0028,0103	US	0000	ALWAYS	AUTO	
Pixel Data	7FE0,0010	OW/OB		ALWAYS	AUTO	

Table 61: SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Specific Character Set	0008,0005	CS	ISO_IR 100	ALWAYS	FIXED	
SOP Class UID	0008,0016	UI	1.2.840.10008.5.1.4.1.1.2	ALWAYS	FIXED	
SOP Instance UID	0008,0018	UI		ALWAYS	AUTO	

Table 62: VOI LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source	Comment
Window Center	0028,1050	DS	Nero:40, Abdominal:60, Default:0	ALWAYS	AUTO	
Window Width	0028,1051	DS	Nero:200, Abdominal:800, Default:200	ALWAYS	AUTO	

8.1.2. Usage of Attributes from Received IOD's

Not Applicable.

8.1.3. Attribute Mapping

DICOM Attribute name	Tag	UI element	Note
Patient's Name	(0010,0010)	Patient Name	
Patient Sex	(0010, 0040)	Patient Sex	
Patient's Birth Date	(0010, 0030)	Patient Birthdate	
Patient ID	(0010, 0020)	Patient Id	
Study ID	(0020, 0010)	Exam Id	The User Interface "Exam ID" can be Study ID, Accession Number or the Requested Procedure ID, depending on the configuration setting.
Accession Number	(0008,0050)	Exam Id	
Requested Procedure ID	(0040,1001)	Exam Id	
Study Date	(0008, 0020)	Exam Date	
Series Date	(0008, 0021)	Run Date	
Series Time	(0008, 0031)	Run Time	
Series Number	(0020, 0011)	Run Number	

Table 63: Mapping between UI elements and DICOM attributes**8.1.4. Coerced/Modified fields**

Not Applicable.

8.2. Data Dictionary of Private Attributes

Not applicable

8.3. Coded Terminology and Templates

Not applicable.

8.4. Grayscale Image consistency

Not Applicable.

8.5. Standard Extended/Specialized/Private SOPs

Not applicable.

8.6. Private Transfer Syntaxes

Not applicable.